VOL. V TORONTO, OCTOBER 1920 NO. 10

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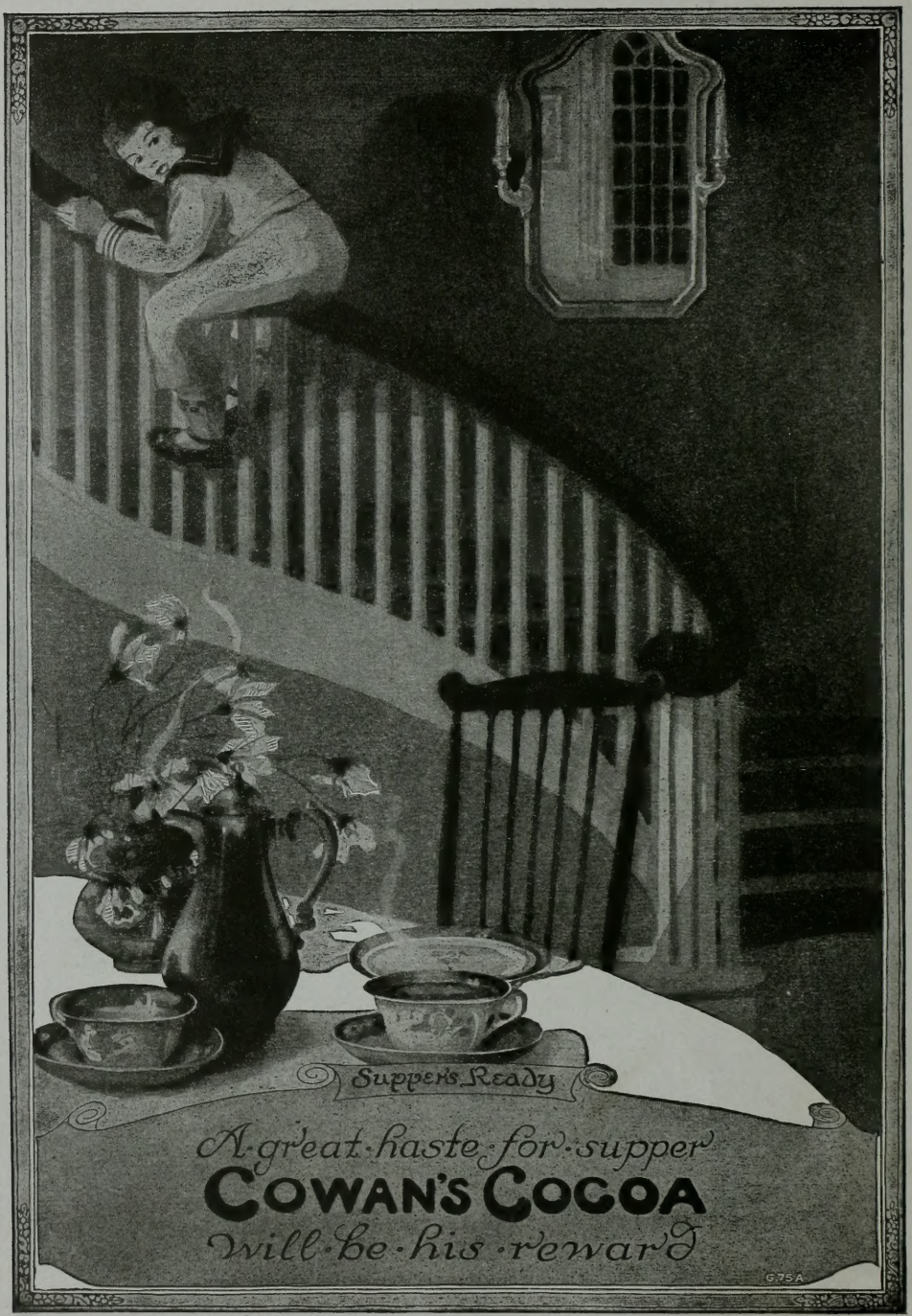
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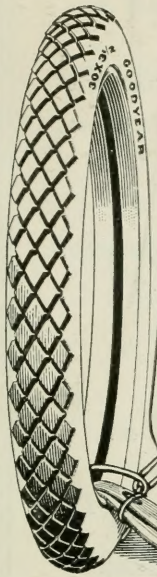

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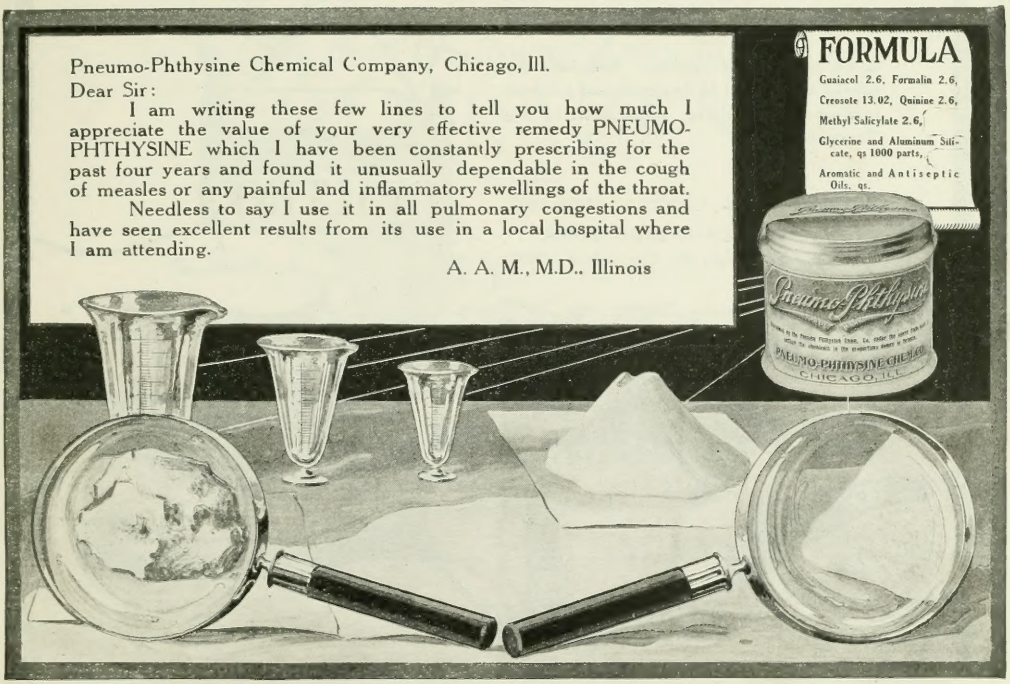
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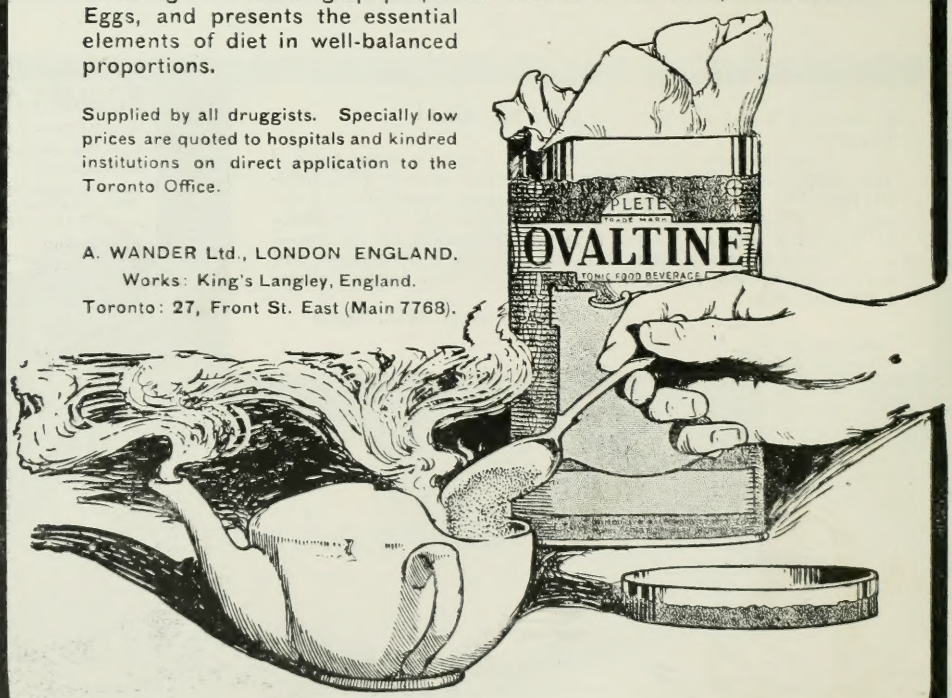

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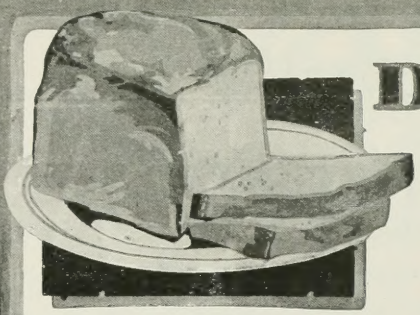

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The Canadian Medical Monthly

VOL. V., NO. 10 TORONTO, CANADA OCTOBER, 1920

EDITORIAL

MEDICAL LEGISLATION

A very formidable share of the general public conscientiously believes that the recognized medical profession holds quite a biased opinion towards the irregular practitioners. This section of the public argues that chiropractors and osteopaths have done good work and therefore are deserving of protective legislation and recognition which the chartered medical profession is endeavouring to its utmost to block. Would it not be well for us to reiterate frankly and frequently our side of the question; to convey to all members of society the true facts, and trust to sound public opinion for a final and satisfactory verdict?

Every registered practitioner in the Dominion of Canada gains his license to practice only upon completion of a well defined curriculum.

Firstly, he must have a high school education before entering upon his course in Medicine in order that he may have the broadened and developed mind to assimilate and appreciate the sciences of the healing art. Then follow five or six years of intensive study at recognized medical teaching centres before being granted a degree. Next comes the Provincial or Dominion licensing examination, the final product being permitted to take his place in the community as a practitioner, approved worthy of public confidence, and only approved after long and arduous toil. The public has a right to demand that every man who calls himself doctor and assays to treat the sick, should at least have had all the advantages of scientific training which modern teaching makes available.

It is this, and this only, that our profession unyieldingly stands for and which we must ever press home to the people among whom we dwell.

We do not question what branch of medical science a practitioner elects to follow so long as we know that the necessary training and qualifications have been attained. We are absolutely uninterested in individual decisions, whether a man practises chiropractic, osteopathy or follows any other one particular line, but it is our absolute duty to insist that such legislation as is necessary be established which will ensure to all society that the appelation Doctor signifies a sound working knowledge of the principles and practices of medicine, with complete elimination of any parasites and fakirs who are a menace to society and a reproach to intelligent legislators who must prize most highly that greatest of duties—the keeping and protection of human health.

FACTORS TO BE CONSIDERED IN THE CONSTRUCTION OF A CHILD'S DIET*

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Our knowledge of nutrition has progressed hand in hand with the development of the science of chemistry. Chemical science gave us the clue to an understanding of the nature of the food stuffs and the changes which take place in digestion, as well as an appreciation of some of the secrets of the metabolic processes which occur within the tissues of the body. Chemistry will continue, as time goes on to aid in extending our knowledge of the finer processes of physiology. Nevertheless it has been possible for a time to advance very rapidly in the study of nutrition, from the technical as well as from the practical standpoint, by a systematic feeding of simplified diets to animals. The results are interpreted on the observations as to the ability or failure, of animals to develop normally, as the diets are modified. Progress has resulted in the past, and will continue in the future to come from the judicious division of labor between the study of food problems by chemical methods, and by animal experimentation.

In the light of certain biological tests, it becomes apparent that a chemical analysis of a food stuff throws no light whatever upon certain aspects of its dietetic properties. It is only by biological methods that we can arrive at principles which can serve as safe guides to the methods of procedure by which proper diets can be planned.

It should be understood that it is neither necessary nor desirable that we should abandon the customary classification of foodstuffs on the basis of chemical composition. We must have a language of nutrition and consider foods on the basis of their protein, carbohydrate, fat, water and mineral content as we have always done. We should be familiar with the quota of energy available from the different types of foods. We must, however, take into consideration certain facts which have not hitherto been considered, and concerning which a chemical analyses gives no information; these factors are termed vitamines or growth elements. The term vitamines was introduced by Casimir Funk in 1912 to designate certain organic bases, the importance of which was recognized as the result of experimental studies on beri-beri. It was demonstrated that the ætiology of this peculiar disease was associated with the lack of the above substance in foods, which had been deprived of the important elements contained in the outer layer or husk of the grain of cereals by too extensive milling, or by the consumption of a diet subjected either to prolonged heating or heating under pressure.

The name vitamines has been applied to these substances for two reasons. In the first instance they are undoubtedly proven to be indispensable to life. It is not exactly known what their physiological function is, but the assertion that they are indispensable is an indisputable fact. In the second place they belong to the class of organic bases exhibiting certain specific chemical characters. A better plea cannot be brought forward in support of the appellation vitamine, than by referring to the well-known fact that an animal is able to live longer when food is withheld altogether than when all known constituents of a diet, with the exception of the vitamines are supplied to it.

With regard to the physiology of the vitamines, it cannot be explained as yet why these substances are so indispensable to the animal organism, but certain facts in this connection which have been gathered so far must be mentioned. First, Funk found that animals fed on white rice showed very marked changes in the chemical composition of the brain. This finding is possibly important, as the most characteristic feature of deficiency diseases is a group of symptoms arising from the central nervous system. It is possible that these changes are due to the half-starved condition of the animals. Another important fact which was discovered a short time ago is that a definite relationship exists between the onset of certain deficiency diseases and the amount of carbohydrates consumed. It was already known for some time to those who had studied beri-beri from the clinical standpoint that with an increase in the consumption of polished rice, the onset of the disease can be hastened. It is also known that deficiency diseases in childhood (especially rickets and tetany and probably scurvy) occur when proprietary foods consisting chiefly of starch make up the bulk of the dietary. This observation we have fully confirmed in the wards and laboratory at the Children's Hospital.

With regard to the influence of vitamines on metabolism some important facts are known. Although the measure of their importance on metabolism is at present obscure, active experiments have demonstrated that in the absence of vitamines the entire metabolism of organic and inorganic constituents goes wrong.

In the various researches in diseases of children of to-day, no group of abnormal conditions has received such intensive study as rachitis, scurvy, tetany, osteogenesis-imperfecta, infantile beri-beri and pellagra, these diseases class themselves under the one heading, deficiency diseases, as they are more or less interrelated ætiologically, possess a striking similarity in symptomatology, and respond in a greater or lesser degree to an allied therapy.

Up to the age of six or seven months, in many cases longer, an infant is fed exclusively on milk. Under normal conditions there is no doubt that mother's milk is an ideal infant's food, but in these days the force of circumstances or numerous other factors, not ordinarily granted much-deserved attention by the medical attendant, may so change the composition of the

mother's milk that it ceases to be a complete food. This failure to be a complete food cannot so far be demonstrated in the laboratory by the ordinary chemical analysis, an analysis to which so many practitioners have attached so much importance. One need not go further than to observe the well-known fact that frequently, during pregnancy and lactation, mothers will desire and seem to exist on a diet which is badly chosen from the standpoint of our recent knowledge of modern physiological standards. We are all ready to admit that frequently these abnormal cravings are in the direction of articles of diet which have a very doubtful nutritional value and from our standpoint also very doubtful powers of maintaining a metabolic balance. May we not, therefore, analyze the congenital deficiency diseases, or those appearing soon after birth in breast fed babies, as deriving causative faction from the deficient maternal diet just referred to. Sufficient analyses of much milk have been made, in the case of mothers where nursing infants have died from infantile beri-beri to show that the lacking factor in the diet cannot be a deficiency in proteins, inorganic salts or even fat and as the infantile malady can be cured precisely like the adult type, by an administration of an extract of rice polishings, it seems logical to conclude in the light of present knowledge that the two are caused by a deficiency of the so-called vitamines. It is likewise probably true that the maternal organism is unable to synthetize vitamines unless they are supplied in the food to the lactating mother. These important facts are not generally known by those who have developing and growing children in charge, and as a result we have a deficiency in the metabolic requirements in many breast-fed infants with scurvy or rachitis, or both, as frank manifestations, and "difficult feeding cases" with even less understood ætiology as more occult manifestations. The above facts are also in perfect agreement with the plentiful evidence that the deficiency diseases of later life, occur more frequently in the female and more especially during the child-bearing period. We can easily verify all these facts by the animal experiments which have been reported by many observers. Unusual physical exertion also requires not only additional calories but also additional vitamines and especially is this true when unusual demands are made upon the powers of the carrying or nursing mother. Pigeons if forcibly exercised and plentifully fed on polished rice develop severe symptoms of beri-beri whilst controls at rest and on the same diet during the same period of time remain far less affected; in fact pigeons at rest may remain free from any discernible symptom of beri-beri for an unusually long time even though fed on an exclusive diet of polished rice and then if suddenly exercised, will develop all the symptoms of beri-beri in a few months.

From these observations we will now pass to the consideration of the artificial feeding of infants on modifications of whole cow's milk, and in handling this problem there are two main points of consideration. First, when milk is subjected to certain degrees of heat either by sterilizing or pasteurizing

experiments recently conducted go to show that the destruction of vitamines or growth element content is destroyed at certain degrees of temperature. Certain investigations years ago showed conclusively that infants fed on pasteurized milk entirely, may develop scurvy. These researches were disregarded for a number of years, in fact their results were questioned by some for a long time. To-day the same evidence which was brought forward in years past is finding growing acceptance. The fact that orange juice might be given as early as the first month with benefit tends to show that in over-heated milk the factor which disturbs the normal metabolic processes of the nursling is not a chemical change in the casein or other protein of the milk as McCollum believes, but as has been proven by recent observations, is due to the inactivation of a definite substance in raw milk which prevents pigeons fed on polished rice from developing beri-beri in the usual length of time; undoubtedly a vitamine. Secondly, the growth element content of cow's milk is by no means a constant factor; it is entirely dependent on the same, or at any rate similar conditions among cows, as has just been discussed in regard to nursing mothers. More particularly does this deserve our attention when we recall that in the summer the cows or other milk-giving animals, gain their supply of fresh milk directly from pasturage, while in the winter the food has been subject to drying, curing and storage, all tending toward inactivation of the vitamine content. Actual epidemics of deficiency diseases among calves and then cows have been described as occurring during the winter in the poorer districts in Switzerland. There is no doubt that if more attention were centred upon these facts that many cases of rickets, as well as some of the other deficiency diseases, would find an ætiology more definite than that with which they are at present dismissed.

Passing to the child of the run-about age, why is it that the deficiency diseases are still manifest when food other than a pure milk dietary is offered. Highly milled cereals cooked interminably to say nothing of the amount of starch solutions already forming the diluents of feeding formulas were previously prescribed in most cases. Actual experiments upon rats fed with certain of the so-called patent foods have proved beyond doubt that most of such preparations are not sufficient to maintain life, to say nothing of promoting growth, though they contain enough protein substance. One may argue that the results obtained in rats may not apply to human beings. Granting that, we still learn that something is missing in certain of these foods, a something which was probably destroyed in the process of its manufacture, since the test animals thrive very satisfactorily if they are fed with the raw materials from which most of these foods are made, or else if some adjuvant containing the missing substances is added to the baby food. The "missing substances" is contained in fruit juice and yeast and both must be administered to make a complete food for the rat.

Now we know from the researches of Funk that the foremost functions of the vitamines are to influence starch digestion, and that when this substance, or these substances, are not present in amounts proportionate to the increased starch content of the dietary the metabolism fails, its balance is destroyed and the patient suffers from the minor or major manifestations of disturbed nutrition or growth, entirely independent of the caloric value of his food intake or its inorganic constituents. Be it in its mildest form of so-called "difficult feeding cases" or in the severest form of rachitis or even death, the cause is the same and the resulting condition simply a matter of degree. What is our problem therefore, Either to diminish the quantity of carbohydrate, principally the starches, or else to supply substances such as fresh or very lightly cooked vegetables or certain extracts which are known to obtain a marked excess of these essential substances. To do the former would mean a loss of calories to the child; to do the latter rarely fails to prove of decided benefit. It is held by many of our most prominent students of nutrition that excessive housing or other unfavorable hygenic conditions are prime factors in the production of deficiency diseases, especially rachitis; this belief received a great impetus in the publication of "Kassowitz" in which he put forth his famous "domestication theory" as an ætiological factor of first importance in the production of deficiency disease in animals. Observations upon animals used by Funk in his experiments on nutrition showed them to be in better condition than others living amid better hygienic surroundings. They were found to be nearly double the size of normal animals, gave no signs of deficiency disease and their offspring were far superior in vitality and growth to those born to animals living under normal conditions. We do not advance this as an argument against proper hygiene in the care of our babies, for it is certain that had the animals lived amid better hygienic surroundings in addition to their high vitamine diet they would have done even better; what is really to be emphasized is the inadequacy of the theory of poor hygiene as the fundamental cause of the deficiency diseases. All of us have seen rickets amid the best hygienic surroundings and have failed to find it universal amid the very worst hygienic conditions. The same applies to all the other deficiency diseases. Other things being equal, however, hygiene undoubtedly plays its part in determining their progress and outcome, as it does in all the other conditions and disease with which we are concerned in our daily work.

Lastly, we have the problem of the child with its likes and dislikes toward certain articles of food and the degree to which those who have the child in charge cater to its wishes. Let us take as our examples the children between the ages of two and four years, for, after all, it is every man's experience that children affected, for instance, with rickets show improvement before the expiration of that period. The explanation is simple if we remember that about this time the diet is varied and includes many fresh foods, such as

juices, fruits, fresh vegetables and the like, which if not overcooked are rich in active vitamines. These substances have, in such cases, again exerted their corrective influence, thereby bringing the metabolic standard up to its proper level. Many children, in spite of this, unfortunately are permitted an excess of foods rendered poor in active vitamine by over-heating; add to this an excessive amount of carbohydrate foodstuff to tickle the palate—crackers, bread, sweets, etc., between meals, or in excess at meals, and we have fertile soil for the development of one or other of the deficiency diseases. As the origin of a "vicious circle" we find an idle effort made on the part of their attendants, perhaps under professional advice, to offset the evident sub-standard development of the child by the addition of more of the "foods" given as samples, thereby not only spoiling their appetite for foods they should have, foods rich in active vitamines, but maintaining the very state of metabolic deficiency which they are attempting to combat. This furnishes us a reasonable explanation for the many cases of overfed weaklings and "sub-standards" that we see, and gives us at least a clue as to how to comfort the broken-hearted mother who gives her progeny "every care" and "the best of food" and yet fails to bring him up to the standard of the "neighbor's baby" who, by the way, "is not nearly so well taken care of." Cases of "persistent rickets" give us no more difficulties as to ætiology, and many hints as to treatment, if we remember the facts just presented.

We now come to the therapeutic principles underlying the management of these cases which also seem to substantiate the writer's belief in their common origin and interrelation. Therapeutically and physiologically in the light of our present knowledge of these substances there may be a difference between the various vitamines. From what has been said it is quite clear that in order to correct deficiency diseases and in fact to prevent deficiency diseases and promote normal growth we must have growth elements present in our food supply. In order to accomplish this certain foodstuffs should be constantly present in our diet supplied in a properly cooked manner, in order to insure of their presence.

Excessively cooked foods should be avoided. Vegetables should rarely be cooked over twenty minutes, and always served with the fluid in which they are cooked, to conserve the valuable vitamine containg substances as well as those inorganic salts soluble in the liquor. Disproportionate amounts of carbohydrate foods should be guarded against unless balanced by the presence of a sufficient quantity of other fresh foods. Maternal regulations are especially important in cases of breast-fed babies where evidence of metabolic deficiency show themselves; in short either a correct diet for the mother or else some form of vitamine, perhaps in the form of autolyzed yeast, may be directly administered to the nursling. In the case of artificially fed infants the early addition of vitamine containing substances and a very decided de-

crease of the amount of highly milled overcooked starchy foods is to be recommended. The important vitamine of orange juice should never be neglected even at one month, as a prophylactic against scurvy. Egg yolk coddled, in gradually increasing doses beginning as early as the sixth month, if necessary, is an important vitamine containing substance often omitted on account of a possible anaphyaxis which some children have against egg albumin. If infants refuse the yolk pure, it may be combined with a cereal and no difficulty will arise, especially if we begin with a small amount. Large amounts of cereals should not be administered unless egg yolk or vegetables juices lightly cooked are administered at the same time. Beginning with the eighth or ninth month, to maintain a metabolic balance and to prevent a condition of under-development as an example of which rachitis is typical, the child should receive mixed purees of various vegetables properly blended with the addition of sufficient carbohydrate and fat to make a "balanced ration."

As a result of careful investigation as to the diet of mothers who have rachitic children, and especially those who have had other children who have had some form of deficiency disease, and furthermore, as to the diet of women during pregnancy, or during lactation, Star, of New York, has come to the opinion that the tendency toward deficiency disease if not the disease itself is inculcated "in utero." The negro and Italian in this country furnish us all the evidence necessary to give this theory a very sound basis to rest upon. We need not here enter into the dietary of the negro and Italian; its peculiarities, expecially as to excessive carbohydrate constituents and excessive stewing with lack of fresh foods are familiar to any one caring to make a study of a series of these mothers and their babies. The varied results obtained in some of our larger foundling institutions and nurseries, and even one's private experience with feeding formulæ find an explanation in this predisposition to deficiency disease on the part of some infants. One child will thrive beautifully on a diet which would give another rickets. Another child will gain half a pound a week on what apparently starves another of the same age. In the former, the child's economy is well within the safety zone of metabolic stability, as a result of a properly proportioned diet of the mother during pregnancy, and so furnishes enough vitamine from the full supply with which it was born to counterbalance an excess of carbohydrates in his formula, and his tissues grow and perform their functions. In the latter, the child has an unstable metabolic balance, owing to the improper selection of the maternal diet and therefore cannot supply the necessary vitamines from its own economy, since it has none to spare; the metabolism is upset, a negative balance of the inorganic salts results, valuable food constituents are not retained by the tissues, the child either develops a deficiency disease or simply fails, and the more we "strengthen" its formula by adding carbohydrates (even if the other constituents are also added) we simply make things worse. The solution lies in adding a vitamine-containing substance.

The results of the study of several representatives of each of the different classes of foodstuffs has led the author to the conclusion that, while it is not desirable to relegate to the background any of the fundamental knowledge of foodstuffs which can be obtained by chemical methods, and by respiration and digestion studies, the fundamental basis of nutrition can best be imparted to the public through the adoption of a biological classification of the natural foodstuffs on the basis of their function. Foods other than milk and eggs of both animal and vegetable origin may be arranged into groups according to whether they represent principally, functioning active protoplasm or deposits of reserve food material, or in animal tissues, highly specialized contractile tissues. From their biological function their dietetic properties can be fairly accurately predicted. This idea together with the knowledge that milk, eggs and the leafy vegetables, the protective foods, are so constituted as to correct the dietetic deficiencies of the seeds, tubers, roots and meat, should form the central idea in the teaching of the science of nutrition. It should be emphasized that the diet is a relatively complex thing, and that none of the essential constituents can be ignored in its planning, but that the observance of certain general rules of procedure will insure that any faults in the diet will be reduced to a minimum.

It is of special moment at this time to emphasize the importance of the dairy industry in its relation to the public health. Mankind may be roughly classified into two groups. Both of these have derived the greater part of their food supply from seeds, tubers, roots and meats, but have differed in respect to the character of the remainder of their diets. One group, represented by the Chinese, Japanese and the peoples of the Tropics generally have employed the leaves of plants as almost their sole protective food. They likewise eat eggs and these serve to correct their diet. The other group includes the peoples of Europe and North America and a few others. These have likewise made use of the leaves of plants, but in lesser degree, and have, in addition, derived a very considerable part of their food supply from milk and its product.

These peoples who have employed the leaf of the plant as their sole protective food are characterized by small stature, relatively short span of life, high infant mortality, and by continued adherence to the employment of the simple mechanical inventions of their forefathers. The peoples who have made liberal use of milk as a food, have in contrast attained greater size, greater longevity, and have been much more successful in the rearing of their young. They have been more aggressive than the non-milk using peoples, and have achieved much greater advancement in literature, science and art. They have developed in a higher degree education and political systems which offer the greatest opportunity for the individual to develop his powers. Such development has a physiological basis, and there seems every reason to believe that it is fundamentally related to nutrition.

There can be no doubt that there is a great lack of knowledge by the people generally as to the importance of milk and other dairy products in the diet. There is no substitute for milk, and its use should be distinctly increased instead of diminished, regardless of cost. Every possible means should be employed to reduce the cost of distribution. The necessity for the liberal use of milk and its products both in the diets of children and adults should be emphasized in order to stem the ebbing tide of its production. It has been pointed out that the value of milk as a food cannot be estimated on the basis of its content of protein and energy. Even when measured by this standard it compares most favorably with other foods, but it has a value as a protective food, in improving the quality of the diet which can be estimated only in terms of heath and efficiency.

An examination of any large groups of people in the cities, will show that where there is a high mortality from tuberculosis, milk is not being used to any great extent, and in any large group where milk purchases are large this disease is not a menace. It is well known that in institutions where tuberculosis is successfully treated milk forms the principal article of the diet of the inmates. This has resulted from clinical experience. There is no other effective treatment for this disease than that of providing fresh air, insisting upon rest and of heightening the body's power of resistance through the liberal use of milk for the correction of faults which the diet will inevitably have when it consists too largely of seed products, tubers, roots and meats. The importance of diets of this character in the etiology of tuberculosis, has not hitherto been appreciated. In the light of facts there can be no reasonable doubt that the importance of poor hygienic conditions and of poor ventilation have been greatly over-estimated, and that of poor diet not at all adequately appreciated as factors of promoting the spread of this disease. Milk is just as necessary in the diet of the adult as in that of the growing child. Any diet which will not support normal development in the young will not support optimum well-being in the adult. Milk is our greatest protective food, and its use must be increased. The price must be allowed to go up so long as the cost of production makes it necessary, and up, as far as is essential to make milk production a profitable business. Unless this is done the effects will soon become apparent in a lowering of our standards of health and efficiency.

THE PATHS OF INTRACRANIAL INFECTION FROM MIDDLE EAR DISEASE.*

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A pyogenic infection of the middle ear cleft may spread in several directions, giving rise to dangerous complications. Of the many possibilities, a burst outwards through the drum membrane is the least dangerous. When pus burrows outwards through the mastoid process to form a sub-periosteal abscess the condition is a little more grave, but on the whole these two results of middle ear infection are comparatively favorable, and permit of a good prognosis. Speaking broadly, these cases in which pus comes to the surface are generally mastoids of the cellular type. The other type, in which the mostoid is solid or diploetic with few cells, is perhaps less liable to be infected in the first instance, but when it is, the consequences are likely to be more serious, as pus is unable to get to the surface, and has to find some other outlet, frequently with disastrous results.

Let us consider the various channels along which infection may travel from the middle ear, commencing with the posterior route. The middle ear cavity is continued backwards from the tympanum and antrum in the form of mastoid cells. These cells vary considerably in size and number, being much smaller and less numerous in the infantile type of mastoid. In the majority of instances they spread back as far as the inner table lining the sinus groove. All the cells communicate directly or indirectly with the main middle ear cavity. From the lining membrane of these cells minute blood vessels drain directly into the genu of the lateral sinus. In the course of an acute inflammation of the mastoid cells, it has been shown by Manasse[1] and others that the infection travels through the solid parts of the temporal bone along the course of the minute bone capillaries. A small celled infiltration occurs in the submucous tissue, extending along the track of the vessels and accompanied by the appearance of osteoclasts. The bone becomes absorbed around the vessels and the purulent process spreads through the narrow spaces till a fistula is formed. When this occurs on the posterior surface of the petrous bone an extradural or perisinus abscess results. The dura is fairly resistant to the passage of bacteria, but after a time they penetrate the wall of the sinus and cause a phlebitis and thrombosis. From the sinus the infection may pass directly through its walls to the meninges giving rise to meningitis.

Most of the veins on the upper surface of the cerebellum drain into one or other of the great venous sinuses. Two veins, one on either side, run upwards

*Presented before the Ontario Medical Association, Toronto, May, 1920.

and forwards from the incisura posterior of the cerebellum and open into a tributary of the straight sinus in the tentorium. Another constant vessel is one which appears in front between the lobulus semilunaris superior and the posterior part of the lobulus quadrangularis, and drains directly into the genu of the lateral sinus or into the superior petrosal sinus. These vessels are thin walled and it is easy to imagine pathogenic organisms passing through to the subarachnoid spaces. These vessels also afford a channel by which infection may reach the cerebellum and give rise to cerebellar abscess. It is known that occasionally the venous flow may be momentarily reversed in other parts of the body, notably the stomach, and it is possible that something of the sort may occur here. One or two large veins from the posterior part of the temporo-sphenoidal lobe and part of the occipital lobe also drain into the lateral sinus a short distance behind the genu, and a similar process may occur here giving rise to a temporo-sphenoidal abscess.

An extra dural collection of pus may cause a localized patch of exudate on the inner surface of the dura. This later becomes adherent to the arachnoid and pia mater and the infection spreads in this way directly to the cerebellum.

There is another less well known route which is worthy of mention. The posterior surface of the petrous bone of an infant shows in addition to the porus acousticus or internal auditory meatus, another large aperture a little above and lateral to it known as the subarcuate fossa. This aperture is as large as the porus, and transmits a fairly large vein, the subarcuate vein, which drains the blood from the aditus and antrum into the superior petrosal sinus. The margin of the fossa is formed by the arch of the superior semi-circular canal, hence its name. This vessel persists throughout adult life, though the fossa becomes reduced to a very small aperture. This is a possible channel by which an infection may pass from the middle ear into the meninges, in cases where no visible track of infection is discovered, and possibly accounts for some of the cases of septic meningitis of obscure origin in children.

Upward Route.

The tympanic cavity proper is subdivided anatomically and pathologically into an upper and a lower part. The upper part is known as the attic or recessus epitympanicus, and in it are lodged the head of the malleus and the body of the incus. These ossicles are attached to the walls of the cavity by various ligaments and folds of mucous membrane. These in conjunction with the tendon of the tensor tympani muscle and the chorda tympani with their covering mucous membrane shut off the outer part of the attic completely from the tympanum. The remaining passage on the inner side of the ossicles is so narrow that any swelling of the mucous membrane would almost completely shut off the attic. Posteriorly the attic is continuous with the aditus and antrum. The roof of the attic and aditus is extremely thin and frequently dehiscent in places so that the mucous membrane and the dura are in direct contact. The outer wall of the

attic in its upper part is bony but the lower part is closed in merely by the membrana flaccida, or Shrapnell's membrane. Suppuration confined to the attic shows itself by a perforation in Shrapnell's membrane. In the case of chronic attic suppuration the formation of cholesteatoma is common, and this condition has a great tendency to cause absorption of the surrounding bone. The thin tegmen is easily eroded and an extradural abscess in the middle fossa may result. Further extension to the meninges or the temporo-sphenoidal lobe of the brain occurs in the same way as that described in the case of the cerebellum.

In the child the petro-squamous suture is as a rule open till about the end of the first year. But an open suture occasionally persists in the adult. In such a case spread of infection upwards is a simple matter. In the child, however, a safety valve is generally provided in the shape of an open squamo-mastoid suture which allows pus to come to the surface of the mastoid instead of burrowing upwards towards the middle fossa.

Downward Route.

The parts in relation to the floor of the tympanic cavity vary considerably in their position. On the floor of the cavity there are generally some air cells in front in the angle between the jugular bulb and the carotid artery, and also in the postero-inferior corner of the cavity. The plate of bone forming the floor is at the same time the roof of the jugular bulb. This plate may be two or three mm. thick, but on the other hand may be of papery thinness, or even absent in places. The bulb may, moreover, bulge upward into the tympanic cavity. Lannois has recorded a case of dilatation of the bulb filling the entire tympanum, occuring in a case of chronic middle ear suppuration. A number of minute vessels from the tympanum drain directly into the bulb, and numerous cases have been recorded in which there had been direct infection of the bulb through the floor of the tympanic cavity.

Forward Route.

The Eustachian tube opens into the anterior part of the tympanum not far from its roof. Around the tympanic orifice of the tube there is a variable number of air cells which may extend forwards and inwards as far as the apex of the petrous bone. Inflammation spreading into the tubal air cells may give rise to a syndrome described by Gradenigo, characterized by intense headache and paralysis of the sixth nerve on the same side. A localized pachy-meningitis is set up over the tip of the petrous bone and involves this nerve as it passes over the tip. This condition generally subsides, but occasionally progresses and eventually causes death from diffuse lepto-meningitis.

Occasionally one meets with cases in which thrombosis of the cavernous sinus follows an exacerbation of otitis media. This may occur from a primary involvement of the superior petrosal sinus and a spread thence to the cavernous, or by direct infection from tubal air cells.

Immediately in front of the tympanic cavity the carotid artery ascends and turns forwards and inwards towards the cavernous sinus immediately below the tube, from which it is separated by the thinnest possible plate of bone. In spite of its close proximity to the Eustachian tube the carotid is seldom invaded by disease, but an interesting case is recorded by Agazzi[2] where death occurred from multiple cerebral abscesses, caused by a local septic endarteritis. The case was one in which an Italian soldier in order to evade front line duty poured some nitric acid into his ear. Widespread necrosis of the petrous bone resulted, partly from the direct action of the acid, and partly from secondary septic infection. Post mortem examination showed that the bone covering the carotid artery was eroded and the artery itself was found to be partly thrombosed.

Another case is recorded by Otto Mayer[3] where profuse bleeding occurred from the ear in a case of extensive tubercular mastoiditis. The patient lost over one litre of bright red blood within one minute. The carotid was immediately tied above the bifurcation. The patient died six months later, and histological examination of the temporal bone showed a defect in the carotid canal with a well organized thrombus in the vessel.

Inward Route.

In the inner wall there are several gateways of infection to the labyrinth. The oval window is closed in by the foot plate of the stapes and its annular ligament. The foot plate is thin and easily penetrated by organisms, as is also the annular ligament, though to a slightly lesser extent. The round window at the lower angle of the tympanic cavity is from its position particularly liable to be bathed in pus, and is closed off merely by the thin secondary tympanic membrane. Penetration of the secondary tympanic membrane leads into the basal part of the scala tympani very close to the orifice of the peri-lymphatic aqueduct, and in the case of a virulent infection bacteria may pass immediately through into the meninges via this channel. The external semi-circular canal juts out prominently on the inner wall of the aditus, and from its exposed position is particularly liable to become eroded from the pressure of a cholesteatomatous mass.

Penetrating the promontory are certain small channels for vessels by means of which an anastomosis between the labyrinthine and tympanic vessels occurs. (Politzer[4]).

One other weak point in the walls of the labyrinth occurs near the ampulla of the posterior canal, which lies in very close relationship to the sinus tympani. The latter is a very large and constant air cell, whose orifice is in the niche of the round window and which extends downwards and backwards medial to the descending part of the facial nerve.

Relative Frequency of Routes into Labyrinth.

In Ruttin's experience of 96 cases of labyrinthitis two portals of entry preponderated[5]. In the cases of circumscribed labyrinthitis and the diffuse serous form a fistula in the external semi-circular canal was most commonly the cause, while in the case of diffuse purulent labyrinthitis a rupture through the windows was nearly as common. In the entire 96 cases there was a fistula in the external canal in 44, and in the oval window in 11 cases. In five cases there was a double fistula of which three were in the external canal and oval window. In 12 no fistula was discovered.

In cases which have died from meningitis or some other cause and in which the labyrinth was just commencing to be involved it has been possible to study the process. In those cases the annular ligament or membrane of the round window were seen to show small celled infiltration with a small collection lymph on their labyrinthine aspect. Later this becomes purulent and the whole interior of the labyrinth becomes filled with purulent exudate. When the involvement of the labyrinth is slow and preceded by a serous exudate the aqueducts are generally gummed off and a generalized meningitis does not follow.

Spread to the meninges occurs also along the course of the cochlear and vestibular nerves. The modiolus of the cochlea is of very open texture and affords very little resistance to the passage of bacteria into the cochlear nerve. From there the infection spreads along the nerve in its arachnoid sheath to the meningea cavity. In certain instances meningitis does not occur but a cerebellar abscess results instead.

In rare instances infection passes along the endolymphatic aqueduct, causing an empyema of the saccus, or an extra dural abscess in the posterior fossa.

While a number of the complications of middle ear disease enumerated are somewhat rare their possibilities should not be forgotten and an early recognition of their onset is important from the point of view of prompt treatment, since it goes without saying that prevention is better than attempting to cure a well established condition.

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SIMULATORS OF GASTRIC ULCER*

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In recent years the conception of gastric disabilities has undergone a considerable change primarily as the result of the study of conditions as they are found on the operating table and secondarily as a result of the diagnostic aid of the rœntgenologist. Clinical and laboratory study has become more exact and therefore less speculative.

Aberrations of gastric secretion, as exemplifived by hyperchlorhydria and hypochlorhydria, are end results. We may visualize stomach conditions in terms of hydrochloric acid, which is the greater activator of the ferments of gastric digestion; its source is the cardiac end of the stomach and its increase due to excessive secretion by the gastric mucus membrane during the process of digestion. According to Ewald[1] and others the range of the normal percentage of free hydrochloric acid one hour after a test breakfast is between 0.1 and 0.2%. According to Starling[2] the gastric juice of the dog contains normally 0.6% free Hcl. Pavlow[3] says appetite spells gastric juice. The innervation apparatus of the gastric glands is stimulated to action by the psychic impulse of hunger. He has proved further that the excitation of secretion as a result of the presence of fluids or solids in the stomach is chemical rather than mechanical. In other words, the ignition of digestion is mental, its continuance dependent on the direct stimulation of the gastric glands by agents generated during the process of digestion.

Our experience with gastric disease leads us to conclude that deficient hydrochloric acid is more common than is generally supposed, especially in gall stone cases. The incident of the stress of discomfort is not so definite in its onset or so readily explainable as in other gastric affections. "And yet the very indefiniteness and the entire absence of such a history as usually can be obtained from a patient suffering from hyperchlorhydria will often lead to a provisional diagnosis of hypochlorhydria." I quite realize my subject covers a field too large for the time at my disposal. Any phase of abdominal disorder from a structural change such as a malignant growth to a simple functional defect such as an inability to take milk may be sufficient to make the presence of ulcer suspected.

*Presented before the Ontario Medical Association, Toronto, May, 1920.

To quote Russell, "There are individuals with limited secretion whose digestion gives no trouble so long as the amount and kind of protein food is in accordance with the quantity of acid secreted or who avoid foods experience has taught them lead to discomfort. Milk is one of the outstanding foods which perturb the meagre secreter, it gives rise to discomfort by the slow disintergration of the case in curd. Not only this but the milk acts as an inhibitor of acid secretion so this additional factor has to be remembered. Some individuals who take an ordinary meat meal with impunity get indigestion if milk is added to it, whereas the hyperchlorhydric takes the combination with impunity and can relieve or remove the discomfort by drinking some."

On the other hand, Pavlow says that, "By everybody milk is considered a light food and is given in cases of weak digestion as well as in a whole series of severe illnesses. In addition milk possesses a further important property. When introduced unobserved into the stomach of an animal, it causes a secretion both from the stomach glands and also from the pancreas, consequently it appears to be an independent chemical excitant of the digestive canal and in this action it is remarkable that we perceive no essential difference in the effect whether the milk be brought unnoticed into the stomach or be given the animal to lap."

All of us have had experience with those who say they tolerate milk badly. Pavlow, on the one hand gives his view from the standpoint of the physiological laboratory, while Russel speaks from his viewpoint as a practicing physician.

From an embryological standpoint the stomach is a developmental dilatation of the primitive foregut. Such organs as the liver and its appendages and the pancreas are also diverticular derivatives from the primitive gut and thus carry with them the same innervation as the intestine from which they are derived. According to Gaskell[5], "the part of the intestine associated with the vagus nerve finds it lower limit at the end of the small intestine. The vagus never sends fibres into any part of the large intestine. The large intestine is however part and parcel of the tube of the alimentary canal and one would naturally expect it to be innervated by the same manner as the small intestine although its motor cells are connected with the central nervous system by connector fibres in the pelvic nerve arising from the sacral end of the body, while those of the small intestine are connected with the central nervous system by connector fibres in the vagus nerve arising from the cranial end of the body."

Pain is the most potent factor that determines patients to seek advice and the abdominal disabilities are no exception to the general rule that discomfort seeks relief.

In dealing with some of the simulators of gastric ulcer we are dealing with lesions that are a reflex cause of the indigestion for which the patient is

seeking help. It is therefore the location of this pain in the epigastric ares that is the chief factor in the simulation. The malefactor may be any viscus connected with the intestinal tract and it may tell the story of its own disease in terms of stomach discomfort.

In pain interpretation the personal factor is important, what is complained of bitterly by one individual is borne by another without comment. A stimulus that in health is unnoticed, reflexly, is transcribed in terms of pain when the resistance of the individual is lowered from infective or other cause. Great stress is laid on focal infection, but often a more potent factor in the determination of pain is the general lowering of vitality consequent on the drive of our system of existence.

Vanderhoof[6] approves of MacKenzie's teaching regarding visceral pain and quotes him as follows: "In the normal processes of life a succession of stimuli is continually passing from the viscera by the afferent nerves to the spinal cord. Here they react upon the efferent nerves which supply muscles, blood vessels, and other structures. Under conditions of health these processes are so conducted that they give rise to no appreciable sensation. If, however, on account of a morbid state in any viscus an increased stimulus passes by the efferent nerves to the spinal cord.

This abnormal stimulus may be sufficient to affect neighboring nerve cells. These cells then react according to their function, a sensory cell by producing pain and the motor cell by the contraction of certain muscles and a secretory nerve by increased flow of its peculiar secretion and so forth. The irritable focus in the cord is of great frequence in stomach affections. When pain occurs after taking food it must not be assumed that there is an inflammation of the mucus membrane or that the stomach is hypersensitive.

The ingestion of food under normal circumstances is accompanied by reflex processes which are not perceived and pain merely indicates that there is an irritable focus in the cord through which these reflex processes pass. The lesion inducing the irritable focus in the cord may not necessarily be a stomach lesion at all but may arise from a neighboring organ whose reflex centre in the spinal cord is in close proximity to that of the stomach." Following this line of thought it is easy for us to imagine the co-operation of connected centres so that multiple reflexes may result from a single stimulus; for example, cutaneous hyperalgesia, muscular rigidity, vomiting, and prostration may all result from a single exciting cause.

An easily interpreted history of a case is often hard to obtain and is frequently far removed from the classical text book story, yet the patient's statement is the one most important diagnostic factor. A careful consideration of the sensations complained of is always in order, for, in spite of the protestations of some authorities, the presence of an orderly sequence of symptoms is often conspicuous by its absence.

Moynihan[7] states that the chief attribute of ulcer pain is its regularity. "In all cases of gastric ulcer there are periods of intermission, longer or shorter, at one period of the year or another; but when the attacks are present the pain which is then the chief feature, always displays regularity. It comes after all meals, even light meals; it is not present after breakfast on one day, after dinner on another and absent entirely on another day. If a meal is eaten pain, during the attack follows invariably. The interval between the taking of a meal and the onset of an attack is fairly constant. As a rule the earlier a pain is felt after a meal the nearer the ulcer to the œsophagus. That is to say, if pain comes, regularly, one or one hour and a half after a meal, the ulcer that causes it is in the stomach, it is a "pre-pyloric" ulcer. If pain comes two, three of four hours after a meal the ulcer lies generally beyond the pylorus. This period of relief from pain after a meal is constant and invariable, both in gastric and duodenal ulcers, until stenosis, subacute perforation, or the forming of crippling and embarrassing adhesions take place. It is not possible to emphasize unduly the importance of ascertaining all the various modifications of the one symptom pain. The constancy of the sequence food, comfort, pain is the most important of all the clinical matters concerned with the diagnosis of gastric ulcer."

Second only to pain in symptomatic importance is flatulence. Clinically we find the feeling of fulness and bloating a very constant complaint. It is due to gas in the stomach and is temporarily relieved by its eructation. The source of the gas is fermentation or secretion from the blood or swallowed air. The swallowing of air in horses and cattle is quite a common habit. Veterenarians call such animals "crib suckers." The habit seriously depreciates their monetary value, and when once formed is rather intractable.

Quite frequently we see on the X-ray plate an area in the stomach picture above the œsophageal opening which is entirely occupied by gas. The swallowing of more air increases the total volume and allows the afflicted one to reserve the œsophageal peristalsis and belch up a bolus of air. Unconsciously air is swallowed in the taking of food and in some cases this is voluntarily supplemented for the reason I have just stated.

We may mention in passing the less constant symptoms of the simulators of gastric ulcer such as deranged appetite, coated tongue, vomiting, salivation, nausea, sour stomach and hemorrhage. Of these vomiting and hemorrhage are associated in one's mind as essential features in gastric ulcer, yet experience teaches us that these symptoms are inconspicuous or relatively infrequent and uncertain in significance. That the vomiting of blood and the passage of blood from the bowels are duodenal ulcer and sometimes so profusely as to immediately threaten the life of the individual, but the hemorrhage manifestations are frequently associated frequent occurrences we all know. Hæmatemesis does occur in gastric and

with other conditions within the abdominal cavity. Infections or functional derangements of the spleen or liver such as splenic anæmia or cirrhosis must be borne in mind as causative factors in hemorrhages from the alimentary tract. Vomiting may be voluntary, to obtain relief, the self-induced ejection of the stomach contents is frequently precipitated by faucial irritation or copious draughts of warm water. Involuntary ejection of the stomach contents is connected with the onset and progress of such a variety of pathological conditions that its significance must depend on the co-related factors in the case.

The appendicular spinal cord reflex area must lie in close proximity to that of the stomach for appendicular indigestion stands first in frequency as a causative factor of reflex chronic gastric disturbance. The mimicry of "Appendicular Gastralgia" to gastric lesions is well established. It takes the form of a continuous discomfort rather than a pain. Epigastric discomfort radiating downwards sometimes to the right is the characteristic symptom in appendicular disorders that simulate stomach disease. Periodicity may be noted as inherent in many chronic abdominal lesions and appendicular stomach derangement is no exception.

So often is the reflex of pain from this source noted that failing to find evidence of disease in the expected viscus it has become almost a matter of habit to suspect the appendix as the offender, its lumen may be blocked or it may be bulbous or kinked or buried retroæcally.

It may occupy any quadrant of the abdominal cavity adherent above to the liver, gall bladder, or spleen below to the bladder, sigmoid or rectum.

Very many cases of gall stones and gall bladder disease are diagnosed and treated as gastric disabilities. As regards the sex incidence of cholelithiasis women are more susceptible than men, the ratio being four or five to one according to different statisticians. It has been stated that ninety per cent. of the women who suffer from lithiasis have borne children. Cholelithiasis symptomatically stands midway between duodenal and gastric ulcer. The time of the onset of pain is nearer the meal than is the case when the lesion is to the right of the pyloric sphineter. It differs in character also in that the ingestion of food does not give the relief experienced in duodenal or gastric ulcer, especially the former. The sense of fulness and bloating in gall stones disease is more marked while the actual gastric distress experienced is one of discomfort rather than pain.

Radiographers claim to be able to detect about 50% of the cases in which gall stones exist. It has happened in our experience that no gall stones were found operatively where the radiologist had given a positive opinion of their presence.

Medical literature reports cases where under the misapprehension that the hemorrhage was of gastric origin, gastro-enterostomy was performed

for the vomiting of pregnancy. Less frequent simulators are of central nervous origin, such as the crisis of tabes, syringomyelia, multiple sclerosis and cerebro-spinal syphilis. Gastric pain due to the hyperæsthesia of acidity may be due to constipation. The pelvic viscera should receive a careful examination before disease in them can be excluded as the cause of upper abdominal pain.

Variously located peritoneal adhesions, post-operative and inflammatory, suffices to mimic efficiently intra-abdominal lesions frequently enough to make us realize that their presence is always a possibility.

Among other diseases from which the differential diagnosis of stomach disorders is difficult may be mentioned tuberculosis and malignant disease of the intestine and other abdominal viscera, hemorrhagic cirrhosis of the liver and splenic anæmia. In looking over the literature I ran across a case where a provisional diagnosis of gastric ulcer was subsequently changed to one of splenic anæmia by a process of operative exclusion, some four major operations having preceded the splenectomy from which satisfactory improvement was obtained. Two of Sherrin's splenic anæmia operation cases had been treated for gastric ulcer.

We have referred briefly to the functional, structual and reflex phenomena —that group around some of the simulators of gastric ulcer. Insidious disease has a pre-diagnostic period, a time when a patient is visiting a physician for complaints which no one can with certainty name. It is well to take a survey of a case as an entity, not forgetting to take into consideration all the associated phenomena which as a complex spells the individual.

In the nervous system of the human body we have a complete, though somewhat complicated publicity system. It is true that it is not always intelligently communicative, but its work is no doubt properly performed and it is for us to more accurately systematize our methods of observation so that we may appreciate the attempt to tell us in terms of pain or discomfort that disease is threatened or has arrived.

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TREATMENT OF ACUTE EMPYEMA*

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The recent epidemics of influenza in 1918-19-20 have broadened our knowledge of acute empyema, and have made us reconsider our treatment, with the result that important changes have been made in the same.

In the cases of empyema associated with lobar pneumonia, by the use of local anæsthetics there was no fear of any immediate mortality from the operation. There was, however, a certain percentage of cases which developed chronic empyema, necessitating extensive and mutilating operations. The late mortality in adults was low, but very high in infants under one year of age. In 24 consecutive cases of empyema associated with lobar pneumonia preceding the influenza epidemic, I had a mortality of one. This case, an infant under 9 months of age, died just after the pleural cavity was opened, and, I may say, that with one exception, that was my last case to be done under general anæsthetic. During 1918-19 there were 26 cases following the 'flu', with a mortality of two. These included two double empyemas, one of which was a fatal case. So far in 1920 there have been 8 cases, one of which was fatal. At autopsy the opposite lung was found filled with multiple abscesses, the boy evidently dying from that condition rather than from the empyema. This makes a total of 58 cases, with 4 deaths; i.e. about 7%. Thus, there were 24 cases associated with lobar pneumonia where rib resection had been done, with one death, or 5%; 34 cases associated with influenza epidemic, 26 with rib resection and 8 treated by the closed method, having a mortality of 3, or 9%.

The results in the treatment of acute empyema are influenced by a number of conditions, namely:

(1) Antecedent disease.
(2) Associated disease.
(3) Type of organism.

Antecedent Disease: In cases that follow acute labor pneumonia the empyema does not assert itself until the third or fourth week. By this time the pneumonic condition has well advanced to a quiescent stage, so that we do not have an acute pneumonitis and an empyema at the same time. Much different is the case associated with measles or influenza epidemics. Here the empyema may be present as early as the fourth day, while the pneumonic condition is still very acute, and, moreover, apt to be present in both lungs. The severity of the disease depends also upon whether it is sporadic or epidemic. Sporadic cases are generally mild, whereas epidemic cases vary from mild to

Presented before the Ontario Medical Association, Toronto, May, 1920.

exceedingly virulent. Certain epidemics are a law unto themselves. Following influenza the empyema is generally the result of rupture of an abscess on the periphery of the lung. The American Commission upon Empyema, (1917-18), reported that in every case of empyema in the influenza epidemic that came to autopsy, one or more of these small ruptured peripheral abscesses were found. This condition was present in the one case in which I was able to obtain an autopsy. On the other hand, these abscesses are not present in the cases following lobar pneumonia.

Associated conditions: In the cases that die within the first three weeks of the disease, various conditions may be found present to cause death. Multiple pulmonary abscesses, purulent pericarditis, septic meningitis, suppurative peritonitis, endocarditis, abscesses in the mediastinum, septicæmia, gangrenous cholycystitis, any or several of these may be found. When death occurs after three weeks, empyema is more apt to be the cause.

Type of organism: It has long been recognized that the mildest cases are generally produced by the pneumonococcus. In the past three years the streptococcus hemolyticus has been the most frequent organism, and has been a great factor in making the condition so serious.

Treatment: This may be divided into three methods:

(1). Aspiration.
(2) Open method, with rib resection.
(3) Closed method, with (a) continuous drainage,
(b) interrupted drainage.

Personally, I believe that all forms of treatment should be done under local anæsthesia. The anæsthesia may be made perfect, and there is no reason why the youngest or the most nervous cannot be done completely satisfactorily in this way. I generally tell the patient one will have to wait some time after the injection of the anæsthetic before the operation can be proceeded with, and, as a rule, can complete the operation before the patient is aware that it has begun.

It is the unanimous opinion that as little as possible should be done for empyema while the pneumonic condition is still active. This is the result of very bitter experience in a number of army hospitals. Before the 'flu' epidemic, whenever pus was found in the pleural cavity, it was an indication for immediate open operation. This view was acted upon in the early part of the epidemic, resulting in a mortality of 40-60%. So high was it that surgeons felt that scarcely worse results would be obtained if the patient were left alone. We must remember, however, that though the greater part of these cases would have died if left alone, there is no doubt that the open operation caused a considerable number of deaths that would not otherwise have occurred. One must realize that in the first three weeks of the disease it is not the empyema that causes death, though an open operation may be a factor. As the pleural cavity fills up aspiration is the proper procedure. This may be repeated in 12 hours, or one or two days. The immediate benefits of this measure are remarkable.

The patient becomes more comfortable, the dyspnœa less, the cyanosis not so marked, and the pulse improves in quality. In a few cases, about 3%, aspiration is even curative. If aspiration of a considerable quantity does not cause improvement in the condition of the patient, you may be sure that there are serious associated conditions present. In the cases following lobar pneumonia, or in the 'flu' cases that develop empyema late, aspiration need not necessarily be done, because, as mentioned before, the condition in the lung itself is not acute.

Shall the further treatment be by the open method, i.e. where air is allowed to enter the pleural cavity, or by the closed method, where air does not enter? With aspiration in the acute cases I don't think there is any appreciable difference in the immediate mortality between the two methods. It depends solely upon the final results whether the open method will be superseded by the closed method or not. With the open method we have been accustomed to promise our patients a closure in at least 19 out of 20 cases, when we treated them by simple drainage without irrigation. In 50 cases where I had done rib resection, there were two cases that required further operation. The one, in which an Estlander was done, had not been treated with irrigation, and it is just possible that irrigation might have prevented a further operation being necessary. Even in the chronic cases of years' standing, two-thirds of the cases may be cured with drainage and irrigation. In the second case a Schæde operation was performed. This man, a patient in a Sanatorium undergoing the nitrogen gas treatment, developed influenza and early an empyema on the bad side. Here there was a mixed tuberculosis infection in an already collapsed lung, and certainly was not a favorable case for a good functional result. I think we are at the present time apt to think too much of the cavity. In checking up cases with the X-Ray, we have seen a number with large air cavities, and with marked contraction of the lung, and later find that the lung has well expanded again. Sterilization of the cavity is a big factor, for an unobliterated sterile cavity, as a rule does not cause much trouble, since in 6-8 months it will obliterate itself. This occurs by expansion of the lung rather than by collapse of the chest wall. Nevertheless, in spite of the foregoing facts, I am inclined to believe that with the closed method and irrigation one obtains a more rapid convalescence, that there is less permanent damage to the lung, and less likelihood of the condition becoming chronic than when rib resection is done. The one disadvantage in the closed method is the amount of time and attention necessary in the after treatment.

The technique of rib resection is as follows: A hypodermic of morphine gr. ¼ is given three-quarters of an hour before operation. The patient is placed upon his sound side and the usual skin preparation done. The inferior angle of the scapula is located, and the second rib below is accurately palpated downwards for a distance of three inches. Using ½ of 1% novocain with 4m. of adrenalin to the ounce, intra dermal injections are made with a small fine needle along this line. Then with a larger and longer needle a subcutaneous

injection is done, keeping the needle along the anterior surface of the rib. Then with a medium sized needle the posterior upper edge of the rib is located, and the needle pushed gently in just above the upper margin, and 5 cc. injected. A similar amount is put in at the inferior edge of the rib. In ten minutes the incision is made, and 1½ inches of rib removed subperiostially. The periosteum is then retracted downwards, a small amount of solution injected into the pleura and the pleural cavity opened. In this way the intercostal artery is very seldom severed. A large piece of gauze is held in the left hand ready to put over the wound, so that the pus will not escape too rapidly, nor spurt into the operator's face. The next step depends upon whether you intend to irrigate or not. If you do not irrigate, I think it advisable to turn the patient upon his bad side, and towards the edge of the table. The pus is then allowed to run out, and with a sponge-holder the large masses of lymph are extracted as they project into the opening. The patient is told to cough a number of times until the cavity is pretty well emptied. If you intend to irrigate with Dakin's solution, afterwards, and I think this is the better way, one should put the drainage tube in as quickly as possible, allowing the least amount of air to enter. Dakin's solution will dissolve these masses of lymph so that they will not plug up the opening. The end of the tube is then placed into a basin with some solution therein, and the pus flows into it, or the pus may be drawn off with a large glass syringe. The patient is then put back to bed in the Fowler's position and the tube connected with a winchester which has a ½ pint of water in it.

Closed method: Various instruments have been advised for this method of thoracotomy, but I believe that a simple trocar and canula is just as efficient, and that the amount of air that enters is negligible. Using the 8th or 9th space, the skin is drawn up from an inch below, anæsthetic injected, a very small incision made with a scalpel, and the trocar is then thrust into the pleural cavity. The trocar is then removed, and the finger of the left hand placed over the end of the canula. A soft rubber catheter of the proper size, with several small openings, and clamped at the end, is pushed into the canula, the canula then partly withdrawn, another forceps placed nearer the proximal end of the catheter, the one on the distal end being removed and the canula entirely withdrawn. Several layers of gauze about ¼ inch in thickness and 3 inches square perforated in the centre for the passage of the tube, is now fixed to the catheter and the chest wall. The adhesive may be changed from time to time. With a large glass syringe the pus is now withdrawn from the pleural cavity. Saline solution is injected first, and if no coughing results, half strength Dakin is then injected and continued until the solution returns clear. Four or five ounces of half strength Dakin solution is left, the tube clamped, and the patient returned to bed in the Fowler position. The irrigations are done 6-8 times daily. As the temperature becomes normal, the irrigations may be reduced to 4 times a day. After the fourth or fifth day blowing exercises may be begun. The patient is got up at the end of two or three weeks, and then the drainage is made interrupted, the tube being clamped by day, and then made continuous again at

night. I believe that walking around is a much more important factor than the blowing exercises. When the bacteriological examination in 10 fields is negative for several days, and also negative for culture, the tube is withdrawn, and the wound generally closes in a few days. I have not used a negative pressure apparatus, although favored by some surgeons. Each time the irrigation is done, sufficient suction can be made with the syringe to create a negative pressure. I have found that by using two drainage tubes a couple of inches apart, and placing one of them into a basin with Dakin solution, the pleural cavity can be more readily irrigated. The time taken for cleansing the cavity is decidedly shorter with the two catheter method, and when irrigations have to be done 6-8 times daily the saving in time amounts to considerable. I have used this in four cases, and the house surgeons much prefer this method. In one case, a double empyema, I used one drainage on one side, and two on the other, the side with the tubes clearing up much more quickly than the other.

Conclusion:

I. Acute empyema rarely causes death during the first three weeks of the disease, apart from operation.

II. All operations should be done under local anæsthesia.

III. In all cases where there is acute pneumonitis aspiration should be done as a preliminary measure.

IV. Later, rib resection and irrigation with Dakin's solution does not give any immediate mortality, being quite as safe as the closed method.

V. The closed method requires much more careful after treatment, but produces as a rule more rapid convalescence, less permanent damage to the lung, and less likelihood of chronic empyema.

VI. Two tube drainage is more satisfactory and requires less time than one tube drainage.

OESOPHAGEAL STRICTURES*

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Cicatrical stenosis of the œsophagus, following upon the swallowing of corrosives, possesses considerable interest because of the rather frequent accidental occurrence, the rapid and consistent development of the stenosis, and also because of the varied appliances and the methods used in the treatment of them.

Many of us have occasion to treat such cases and not all of us have at hand such appliances or are adequately conversant with the methods of treatment to undertake the task without some hesitancy.

The condition is as a rule not difficult to manage, provided that care and gentility be coupled with a thorough knowledge of procedure. It is also of convenience to the patient to remain near his home while he is undergoing the course of treatment which will require months and probably years before one is quite certain that a cure has been established.

It is for this reason that I have reviewed the subject, and have presented what I would consider a case in the extreme, for treatment.

I will first consider a few details with respect to the landmarkings of the œsophagus. "It begins at a point behind the lower border of the ericoid cartilage on a level with the sixth cervical vertebra; and joins the stomach about three-quarters of an inch after passing through the diaphragm. The lower level of the œsophagus is on a level with the spine of the twelfth dorsal vertebra. In the normal adult the upper level of the œsophagus is about six inches (15cm) from the incisor teeth, ten inches (28cm) to where the left bronchus crosses in front of the œsophagus, sixteen inches (401/2 cm) to the lower end of the œsophagus."

"The normal œsophagus presents two distinct constrictions, one situated at its beginning and one at a point where it crosses the left bronchus. Both constrictions are of the same size, and will admit without injury an instrument with a maximum diameter of four-fifths of an inch."

The course of the œsophagus is not always a straight one, but may present certain irregularities such as saculations and tortuous undulations. These are usually considered as abnormal but should be looked for in the treatment of such cases.

Œsophageal constrictions due to the swallowing of corrosives have been found at the following levels:

Guisez reports 38 cases, most of them being located at the cardia.

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* *Presented before the Canadian Medical Association, Vancouver, June, 1920.*

Jackson, Chevalier, reports 28 cases, 18 being in the middle; 6 at the level of the hiatus; 4 near the crico pharyngeus.

Charles J. Imperatori reports 1, 15 to 16 em from the upper teeth; 1, 27 em from the upper teeth; 1, 2 em below the cricoid. And a second in the same case 34 em from the upper teeth.

Thomas Hubbard reports 2 cases, ages 1 to 5 near the cardia; 1 case, 6 years in the lower 3 or 4 in. (8 to 10 em) Fr. the cardia.

Nathan W. Green reports 1 case, 8 years, in the lower 4 in. (10 em) of the œsophagus.

E. M. Eberts reports a child of 4, 2 em below the ercoid the upper border of the manubrium sterni.

One case in my own personal observation—the level of the left bronchus and a second lower down.

From the above one might judge that a cicatrical stenosis might occur at at any point along the œsophageal tract, and that the point of election for such a condition to occur might vary with the point at which the peristaltic wave might obstruct the descent momentarily.

"Strictures might arise after any inflammation produced by the swallowing of foreign bodies, such as fish bones, coins, pins, plates of false teeth, etc., the impaction may be followed by ulceration, suppurative cellulitis, or even perforation and death from hæmorrhage; owing to one of the large vessels being opened."

The condition may also arise from specific causes such as tubercle, syphilis, thrush, or diphtheria.

Strictures may also be congenital in nature.

Simple strictures arise more frequently from the swallowing of corrosive poisons.

The healing of a gastric ulcer may also cause a stricture near the lower end of the œsophagus.

It is with stenosis due to the swallowing of lye that I propose to deal in this paper.

The swallowing of lye being particularly prone to produce a corrosive effect upon the upper digestive tract, regardless of the quantity, it has been suggested by several that lye containers be labelled as poisons.

Lye is more frequently swallowed by the child because of it being so carelessly handled and permitted to lie about where it is extremely accessible.

Shortly after its ingestion, Œdema develops and the mucous membrane becomes macerated and soon peels off. As the acute inflammation subsides the symptoms of obstruction may entirely pass away, to be followed by gradually increasing difficulty in swallowing, which may not appear for some time and is not attended by pain. Fluids and soft foods are most easily swallowed, and these patients soon learn to chew their food well, to eat slowly and to swallow small quantities at a time.

Dilitation above the stricture often occurs and food accumulates in the dilated part, causing frequent regurgitation of food and mucous. As the obstruction increases the nutrition begins to suffer and a severe grade of emaciation and anæmia is finally reached, ending in death from starvation unless relief is obtained. Thomas Hubbard reports a case with the following unusual features: "The strictures involving the lower three or four inches of the œsophagus, the canal being very tortuous, with small sacculations between the constrictions."

The diagnosis of œsophageal strictures can be made by the administration of a bismuth or barium meal and radiography; two views should be made, a lateral and an antero-posterior view being taken, and the extent and character of the stricture studied stereoscopially. The fluoroscope might also be used. There is always danger in doing blind bouginage, as the tube might be very easily perforated and a fatal cellulitis set up. At this juncture it might be well for me to report the case of a man, age 45, who came to me in 1913 complaining of having swallowed an unmasticated piece of beef, and that it had been lodged in his gullet and that it had been there for about three hours. I attempted to pass it by the use of an œsophageal bougie, but failed after several careful attempts. It was located at about the level of the left bronchus. I had him placed in the hospital for further attention. After a couple of hours he began to complain of excruciating pain in the epigastrium, his pulse became very rapid and of poor quality and symptoms of collapse were pre-eminent. Morphia and atropine were administered without relief. I then decided to do a gastrostomy and explore the cardiac end of the œsophagus with my finger, and upon doing so I discovered that it was very difficult to enter. I dilated it thoroughly and had the patient brought back to the ward. He made a good recovery and could swallow food the following morning, and soon took soft foods and finally solids. I then closed the gastrostomy wound after a period of five days. Fourteen days later he developed a right sided empyema, which was drained in the usual way by rib resection. The wound took a long time to close but rapidly did so after the use of vaccines. He has been in excellent health ever since.

In the survey of the literature on œsophageal strictures I find that very many different procedures have been adopted in their treatment. Mr. Kendal Frank used an Ottis dilating urethrotone with blade removed which was screwed up and withdrawn fully expanded, this was done laterally and antero-posteriorly; an œsophageal bougie could then be passed from above.

Abbe, of Newport, advised what he calls the "string" method in the treatment of dense fibrous strictures. A gastrostomy having been previously performed, a small gum elastic bougie is guided through the stricture from below up into the mouth, and a stout silk ligature passed in the same way. This silk ligature being see-sawed backwards and forwards, when the stricture was felt to yield. Large bougies are then passed.

Dunham caused a string to be swallowed and then used the Abbe method.

Ochsner draws a rubber tube under tension through the stricture, when the tension is taken off the tube, it expands and so dilates the stricture; in the course

of a few days a larger and also double tubes are introduced. He is said to obtain good results.

Hubbard states—"that for safety and precision the Sippy method is ideal. The essentials are: First—know your measurements; Second—be sure you are well into the stomach with wire guide and then go clear through with the properly selected olive bulb on the cable. If you try too large an olive and fail to get through you may pinch a band of stricture tissue between two of the olives on extraction, rather risky but even at that sometimes beneficial. The successful dilitation of strictures of this class makes possible, but does not ensure a cure. It is important to decide on the maximum dilitation, hold it there, and in children try to keep up with growth. It should be 26 in a three year old child and from 35 to 40 in an adult. In holding a maximum dilitation, the author favors passing a specially adapted olive bulb at frequent intervals, rather than the flexible bougie; one knows positively when one is through the stricture; with the flexible bougie, one is never quite sure. In gastromized cases, the stomach tube should be retained after dilitation is well advanced, to give confidence to the patient, and also in case there is considerable trauma from dilitation, the œsophagus may be rested by direct feeding until inflammatory reaction has subsided."

The writer's case was a child of 20 months who had swallowed lye three months previously, ever afterwards he has had difficulty in swallowing; while at first he could swallow without vomiting it caused him to cry and he would take food with difficulty. About one month later he would regurgitate most of the food taken; liquids only being taken and retained and that in very small quantities. He gradually became pale and emaciated, when the parents for the first time became alarmed. The child seemed normal in every way apart from the pallor and emaciation. A small sized olive pointed bougie was passed without great difficulty and others up to size 18 Fr. This was done once a week for three weeks. Regardless of the fact that the parents were warned of the necessity of returning regularly for treatment, they did not appear for two months, at which time the child was in a seriously aggravated condition, unable to retain even water or saliva. Repeated attempts were made at passing bougies of various sizes but all was failure. The child being in extremis and in order to save its life a gastrostomy was deemed advisable. A thorough examination was made when it was found that a distinct saculation existed above the level of the left bronchus and merely a suspicion of a little of the barium meal was seen to trickle through. We then tried to get the child to swallow a silk thread, but after repeated trials it seemed impossible. Gastrostomy was performed and retrograde dilitation carried out without great difficulty in the following manner:—Following out a procedure very similar to that used by Abbe, a small filiform bougie was passed from below upwards through the stomach to the mouth. To the end of the bougie were fastened two coarse silk cords; these were drawn through the stricture and out through the mouth. To the lower end of one was interwoven a parachute contrivance consisting of four

similar sized cords which were fastened to a circular cord in the same fashion, on which rode the various bougies until a 26 F was passed, retracting each bougie alternatively with the obturator.

These manœuvres were accomplished with but little difficulty. It was also discovered that a second obstruction was encountered at the lower end of the oesophagus. The gastrotomy wound was closed in the usual way.

Subsequent passage of a full size bougie for this particular age was done once a week for two months and later twice monthly and the interval being gradually lengthened up to the present. The result so far has been very satisfactory.

The object in using the four corded parachute was to assist dilitation and do away with the see-saw method of Abbe.

The four cords are kept under tension by traction from below on the handle of the obturator. Thus the olive is guided through the stricture by the cords, each assisting in the process of dilitation.

The conclusions arrived at by the review of the various methods are as follows:

1. It would seem that complete stenosis of the oesophagus is a very rare condition.

2. One should make sure that the patient returns for treatment and that too long a time does not intervene between the various bouginages. It might also be wise to have them return once every six months for a period of several years or probably for life.

3. The earlier the stage in which dilitation can be done and the younger the patient the better the result.

4. The method of procedure for the different types of cases might be classified as follows:—

(a) Those in which the stenosis will permit the passage of a bougie with or without the use of the œsophagoscope.

(b) Those in which one cannot successfully use an œsophagoscope. In these cases a Mixter's cord could be swallowed and the Sippy Method adopted.

(c) Where there is almost a complete closure with a large sacculation above the stricture and there is existing a condition of water hunger. In this case it might be well to do a gastrostomy and a retrograde dilitation carried out, assisted, if necessary, by bouginage from above, under guidance by direct vision.

The worst type of case encountered is one where there exists multiple strictures, with sacculations in a tortuous passage. In this type one should not wait too long before successful bouginage is carried out. The firm strictures at the upper levels might be dilated through the œsophagoscope and then the retrograde process completing the cure.

Slow dilitation seems less dangerous than the more rapid methods.

It has been found that in the use of the Sippy method that where formerly olive-tipped bougies were threaded over the silk cord as a guide, a stiffer guide

would be much better and piano wire having a small eyelet welded to its end has been used.

It would therefore seem advisable where bouginage fails with the assistance of the œsophagoscope, to adopt some such method as suggested by Sippy and its modifications.

On the other hand one is liable to failure in certain cases and the retrograde route will have to be adopted.

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THE 10TH ANNUAL CONGRESS OF THE AMERICAN COLLEGE OF SURGEONS, MONTREAL, OCT. 10-16, 1920.

The recent convention in Montreal impressed one as an international event of importance. The art and science of surgery, like all true arts and sciences, admit no parochial boundary, but demand for their learning a universal scope. Something humaner than a strict principle, however, made of this congress a harmonious gathering. Surgeons of the United States, of England and of Canada met in a Canadian City, and found the exotic touch of nationality equally as interesting as the technicalities of their discussions. The tremendous ovation tendered Sir Berkeley Moynihan by the American surgeons was not merely a tribute to his personal prowess, but also an expression of international goodwill. British conservatism and American radicalism, both in speech and work, were blended into an admirable mixture, and given a very noticeable flavour by the contributing Canadian element.

From a technical standpoint, the congress was admittedly inspiring. The co-operation of Montreal hospitals in providing abundant clinical material was appreciated by every visitor, while the afternoon and evening symposiums proved unusually stimulating. Space is lacking even to mention the masterful papers which were given; but from the entire week, a few condensed impressions remain,—the importance, in surgical diagnosis, of history taking and symptomatology; the fixing to their proper places of the X-Ray and the laboratory; and a hint of the true *group medicine* of the future, in which a patient will benefit by the combined knowledge of the physiologist, the internist and the surgeon.

TECHNIQUE OF THE TRANSFUSION OF WHOLE BLOOD AND ITS VALUE IN ASSOCIATION WITH SURGICAL PROCEDURES IN THE TREATMENT OF PERNICIOUS AND OTHER SEVERE ANEMIAS.

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While the transfusion of blood as a therapeutic measure dates back to the fifteenth century, its use as a practical procedure is a comparatively new acquisition in the field of surgery. Recently, because of the increased interest in the possibilities of transfusion many methods of transfusing blood have been devised. With the development of these various methods many of the factors responsible for the untoward symptoms following transfusion have been eliminated, as a result of which, transfusion of blood can be done with very little risk to either the donor or recipient.

The results of transfusion work done during the past few years have demonstrated the superiority of the usefulness of blood transfusion over all other solutions in the treatment of many of the anemias.

It is a well known fact that the administration of normal salt solution or the various modification of Ringer's solution, either intravenously or subcutaneously, has a marked beneficial effect in certain conditions where more fluid is needed than can be ingested by any other means. By this form of treatment then, one can hope only to give an increased amount of body fluid. On the other hand, by transfusing whole blood one injects a living tissue which has functions inherent on its own constituents, and which thereby serves an entirely different purpose.

Blood transfusion is indicated as a surgical therapeutic measure whenever all or part of the elements of the blood tissue are needed and cannot be obtained in sufficient amounts from the hematopoietic organs. These elements may be required—(a) to replace loss of whole blood, (b) to increase coagulability, (c) to stimulate the hematopoietic organs, and (d) to stimulate resistance to infection and various other toxic processes.

For transfusion we use the plain whole blood, administered by a paraffin tube method in which the air is excluded from the blood by a column of liquid paraffin, delivering the blood to the patient in as near its normal state as is possible by an indirect method. It seems more rational not to add anything to the transfused blood or take anything from it, as is done by the citration of blood or its defibrination. A higher per cent. of reactions occur following citrated transfusions than when just the plain whole undiluted blood is given. There is no method of transfusion free from reactions. The exact cause of mild reactions between bloods which have been tested as compatible is

*Presented before the Ontario Medical Association, Toronto, May, 1920.

unknown. It is evident, however, that some change invariably takes place in blood as soon as it leaves the circulation. The conspicuous change is that of clotting. Drinker and Brittingham (1) found that the early changes incident in blood coagulation result in the appearance of abnormal proteins in the blood, and that there is no method of transfusion, with the exception of vessel to vessel suture, free from the possibility of their production. There is no practical method for citration of large quantities of blood which prevents these early changes of coagulation. The methods in use simply arrest the process. Drinker and Brittingham found that the citration of blood alters the erythrocytes so as to render them more susceptible to hemolysis when injected into the circulation, and they concluded that three elements make up the final total of reactions in citrate transfusion: (a) very rare gross incompatibilities which escape in vitro detection, (b) changes in the plates, part of the process of coagulation, (c) direct action of the sodium citrate on red cells promoting hemolysis. While it is evident that the reactions following the use of citrated blood do not seriously interfere with its therapeutic value, we are inclined to believe that in severe anemic patients the use of undiluted blood has an advantage.

A direct method of transfusion would be the ideal transfusion were it not for the technical difficulties in administering same. These, however, are so great that the average surgeon cannot give a direct transfusion with a definite degree of certainty of success. It is for this reason that the direct transfusions have been replaced by the indirect methods, of which there are many.

The method of transfusion selected should be simple and rapid, and preferably one in which plain whole blood is administered without mixing with any foreign substance.

Preliminaries to Blood Transfusions.

The most important part of transfusion is the selection of a healthy donor and the making of hemolytic and agglutination tests between the two bloods. In addition to this, it is well to determine as nearly as possible the exact condition of the blood before transfusion in both donor and recipient. This examination should consist of a red and white cell count, hemoglobin percentage, coagulation time, a differential count and a description of the various types of corpuscles.

Donor

In selecting a donor it is most important, in addition to making hemolytic or agglutination tests, that a careful history be obtained from the donor, also a complete physical examination made, including a Wasserman test. Donors should not be chosen from persons giving a history of recent attacks of typhoid fever, pneumonia, diphtheria, tonsillitis, malaria or influenza, or from persons suffering from tuberculosis, chronic arthritis, rheumatism, or where there is a history of hemophilia.

Hemolytic and Agglutination Tests.

A hemolytic or agglutination test of each blood upon the other should always be made before transfusion, because it has been found that in a considerable percentage of cases there is a tendency of the serum of one blood to cause a disintegration of the red cells of the blood from another individual, even when the latter be a near relative. While the bloods from members of the same family are more apt to be compatible with each other than an alien's blood, still it is never safe to use even a close relative as a donor without making a hemolytic test between the bloods to be mixed.

Agglutination Test.

During the past five years the reader has been determining the hemolytic action of the blood by the Moss (2) method, the technique of which has been modified by Brem (3). This method is based on the principle that before the serum of one blood will cause an hemolysis of the corpuscles of another, it will first or simultaneously cause an agglutination of the corpuscles. The reverse, that all cases that show agglutination will also show hemolysis, is not necessarily true, only occurring in about 20 per cent. of cases. Adopting this principle, all bloods are classified according to the agglutinative properties of their elements into one of four groups. In selecting a donor it is always advisable to have one whose blood belongs to the same group as that of the patient. If this is impossible, the donor's blood should belong to a group whose corpuscles are not agglutinated by the serum of the patient. The bloods of group IV. answer this requirement for all the other groups as its corpuscles are not agglutinated by the serum of any group. Fortunately, group IV. is the most common group, Moss having found that 43 per cent. of all individuals belong to this group. Moss found that all bloods, whether normal or pathologic, could be classified into four groups by agglutination tests of the serum against the corpuscles. He has found the groups to be as follows:

Group I.—10 per cent.—Serum does not agglutinate corpuscles of any group. Corpuscles are agglutinated by serum of II., III. and IV.

Group II.—40 per cent.—Serum agglutinates corpuscles of groups I. and III., not IV. Corpuscles agglutinated by serum of III. and IV., not I.

Group III.—7 per cent.—Serum agglutinates corpuscles of groups I. and II, not IV. Corpuscles agglutinated by serum of II. and IV., not I.

Group IV.—43 per cent.—Serum agglutinates corpuscles of groups I., II., and III. Corpuscles are not agglutinated by any serum.

The serum of one group will not agglutinate the corpuscles of blood belonging to the same group.

In grouping the blood, the unknown blood should be tested with a blood whose group is known. This "standard" blood must belong to either group II. or III. in order to be of any value in grouping other bloods. The group to which a blood belongs becomes fixed by the third year of life and remains

constant. It is not influenced by age, disease or transfusion of blood belonging to another group.

Technique of Grouping Blood—(*Brem*).

Ten to twenty drops of blood are collected in a small test tube from the lobe of the ear. This is allowed to clot, and then the tube is centrifuged so as to obtain a clear serum above. This is the protective serum when used with its own corpuscles, but when it is used with the corpuscles of another blood, it is called the agglutinating serum. In another small test tube are collected two drops of blood in about 1 cc. of solution composed of 1.5 gm. sodium citrate, 0.9 gm. sodium chloride in 100 cc. of distilled water. This gives approximately a 5 per cent. suspension of the corpuscles. This tube requires no further preparation. Upon cell slides, rimmed with petrolatum to prevent evaporation, are made ordinary hanging drops. On one slide is placed: two loopfuls of "standard" serum (agglutinating serum), plus one loopful of the suspension of corpuscles of the blood to be tested, plus one loopful of the protecting serum, that is, the serum from the same blood as the corpuscles. On the other slide: two loopfuls of the unknown serum (of the blood to be tested), plus one loopful of the suspension of corpuscles from the "standard" or known blood, plus one loopful of its protective serum.

These are placed under the microscope and the reaction noted. By comparing the reactions found with the table given above the individual's grouping is determined.

An endeavor should always be made to have the donor and the recipient of the same group, so reducing to a minimum the possibilities of reactions. If, in an emergency blood must be given immediately, or if the recipient be a member of group I. or III., the rarer groups, certain deviations may be practiced in which bloods of unlike groups can be used. Under such conditions the serum of the recipient must never agglutinate the corpuscles of the donor, while the serum of the latter may agglutinate the corpuscles of the patient. The serum of the donor, as it enters the blood stream of the recipient, is diluted to such an extent as to be practically inactive. The lack of agglutination of the patient's corpuscles are protected by its own serum, i.e., the protective serum.

Vincent's Method of Determining the Moss Grouping of Blood.

Because of the technical difficulties of grouping bloods in a private home without any laboratory facilities, Vincent worked out a method by which a patient's blood can be determined in from three to five minutes, requiring no laboratory facilities.

In making the test one must have on hand a stock serum from an individual whose blood belongs to group II. and from one in group III.

Technique of Grouping the Blood.

One drop of group II. serum is placed on a glass slide near one end, and one drop of group III. serum on the same slide near the other end. A drop of

blood from the person to be grouped is mixed with each of the serums on the slide and the reaction noted. Clumping of the corpuscles, if it takes place, will occur in from one to three minutes, and can be readily seen with the naked eye. The various groups will be noted by the following reactions:

(1) If agglutination of the corpuscles takes place in the group II. serum, and not in the group III. serum, the blood being grouped belongs to group III.

(2) If agglutination is noted in the group III. serum and not in the group II. serum, the blood being grouped belongs to group II.

(3) If agglutination is noted in both group II. and group III. serums, the blood being grouped belongs to group I.

(4) If agglutination does not occur in either serum, the blood being grouped belongs to group IV.

In noting the reaction, if by simply looking at the slide with the naked eye there is any doubt as to whether or not agglutination has taken place, this can be definitely determined by placing the slide under the microscope. From the above it may be noted that,—if one has on hand a stock serum belonging to group II. and to group III., the technique of grouping blood is very simple and can be done in a few minutes, even without any laboratory facilities. The simplicity and rapidity with which it can be done is the only advantage it has over Brem's technique as previously described.

The determination of the hemolytic reactions of blood by the Moss method in the selection of donors has proven very satisfactory in our hands. Since adopting this method over 500 transfusions have been made, encountering only two cases of hemolysis. The milder reactions have been rare.

Except in extreme emergency cases one is never justified in making a blood transfusion without first having made a hemolytic test between the two bloods to be mixed. Even between near relatives, such as sister to sister, or parent to child, etc., severe fatal hemolysis may occur from mixing the two bloods. In case of a large family in which the father and mother are not in the same blood group, usually some of the children will be in the same group as the mother, and some in the father's group, and occasionally some in still another group. Thus it is plain that a brother might be a suitable donor for one brother but not for another, also he might be a suitable donor for one parent and not for the other, thus making it a dangerous procedure to transfuse one member of a family from another member without first determining the hemolytic action of one blood with the other.

The Reader's Method of Transfusion.

The method is an indirect closed method and consists of drawing blood into a specially designed glass tube, then injecting it into the vein of the recipient. The tube is coated inside with solid grocer's paraffin and liquid paraffin is floated on top of the blood, preventing the blood from coming in contact with the air.

Description of Tube.

The tube to be described is a modification of the Brown tube, which was modified with the object of making a venous transfusion tube and also a tube more easily constructed. It consists of a glass cylinder 5 cm. in diameter, with a canula leading from one end, the other end being drawn out into a tube about one cm. in diameter, to which a "y" connection containing a two-way valve is made. To one arm of the "y" a rubber tube is attached for suction to aid in filling the tube, and to the other arm a rubber bulb is connected to aid in injecting the blood. The tube differs from the Brown tube in that there is no side tube coming off from the cylinder, and the upper end of the cylinder, instead of being closed with a large cord, is drawn out into a tube for the "Y" connections as described above. The canula part of the tube is so constructed that it can be inserted directly into the vein of both donor and then the recipient. An open dissection of the vein of both donor and recipient is made for two reasons: First, if the operation were done subcutaneously it would be necessary to use a needle with a rubber connection to the canula, which connection would make a roughened area which would favor clotting, whereas with the smooth, paraffin coated canula, there is no such tendency. Second, after the tube is filled with blood, the canula can be inserted into a vein of the recipient without delay, an essential feature after blood has been withdrawn.

Preparation of Tube.

The tube should be cleansed by washing with water, alcohol, and then with ether, and after it is perfectly dry, two ounces of melted grocer's paraffin is poured into the tube through the upper end. It is then wrapped in a towel and placed in a steam autoclave for fifteen minutes under fifteen pounds of pressure, after which, with sterile rubber gloves over the hands, the tube is rolled around while cooling, so that every part of the inside is covered with melted paraffin, and any excess allowed to run out of the large end. Care should be taken not to allow the canula to become plugged with paraffin; if it does, the tip is warmed over a flame and the plug of paraffin allowed to run out the end of the canula. Sterilizing the rubber tubing, "Y" valve and mouthpiece, is done by placing them in a towel and autoclaving in the same way and at the same time as the transfusion tube, or by boiling them for twenty minutes. The atomizer bulb is thoroughly washed with alcohol to sterilize it. When ready to use, the connections are all made and two ounces of sterile liquid paraffin aspirated into the tube through the canula by means of suction at the mouthpiece. A more simple method of sterilizing the tube consists of first pouring the melted paraffin into the tube, then carefully heating the tube over a gas burner until the parffin begins to smoke. The excess paraffin is allowed to run out of the tube, and the tube is carefully rolled with the hands while the paraffin is cooling, thus evenly coating the entire tube.

Technique of Transfusing the Blood.

The arms of both donor and recipient are prepared as for surgical operation. Proper constriction of the donor's arm is essential if one wishes to draw off a large quantity of venous blood rapidly. Constriction by means of a rubber tube is not satisfactory, because the amount of pressure is not known, nor can the pressure be varied as desired. An ordinary blood-pressure apparatus placed about the arm and pumped up to 50 to 80 mm. of mercury, depending upon the rapidity with which the blood flows, makes an excellent constrictor. By this means the venous circulation is impeded, but not the arterial, thus making the entire arm a blood reservoir, increasing the pressure in the vein selected.

It is imperative to use a separate set of instruments on different tables for donor and patient, in order not to transmit infections from patient to donor. Under local anesthesia, using one-half of one per cent. novocain solution intradermally, an incision is made over the cephalic vein just above the elbow on both the donor and recipient, and a ligature placed about the vein on its proximal portion in the donor, and on its distal portion in the recipient. Small Carrel clamps are placed on that portion of the vein away from the ligature in each patient and a longitudinal incision 3 mm. long made through all coats of each vein midway between clamps and ligature. Small retention clamps are placed on the two edges of the incision in each vein in order to hold them open.

Just before the tube is inserted into the donor's vein, about 25 cc. of sterile liquid paraffin is aspirated into the tube. The canula is placed pointing distally into the vein of the donor and the Carrel clamp released from the vein. Slight suction will facilitate filling the tube with blood. The blood is well protected from the side of the glass by the paraffin coat. As the tube fills, the liquid paraffin floats on the blood, thus preventing the blood from coming in contact with the air. As soon as the tube is filled, which in our experience averages about three and one-half minutes to withdraw 600 cc. of blood, the "Y" valve is closed, the canula removed from the vein and the small clamp reapplied to the donor's vein. The canula is now quickly placed in the lumen of the vein of the recipient and the Carrel clamp released. The blood will now flow into the vein of the recipient toward the heart, the velocity of which flow may be controlled by careful pumping of the rubber atomizer bulb. As soon as it is evident that the blood is flowing properly an assistant may release the constrictor from the donor and ligate the vein distally to the opening from which the blood has been taken. Not more than five minutes should be utilized in obtaining the blood. The tube can be emptied in about a minute and a half, but greater deliberation is advisable so that possible hemolytic phenomena may be noticed, acute dilatation of the heart avoided, and so that aeration of this venous blood may be more ready. Inhalation of oxygen in very weak patients is advisable during the injection of large amounts of venous blood. The length of time required to fill the tube with blood varies with different donors. It is well to have two tubes ready, so that if it is found that the first tube fills slowly,

taking more than five minutes to get the required amount, the process may be repeated with the second tube, aspirating only the remainder of the required amount of blood.

Factors of Safety.

The chief points to be borne in mind in blood transfusion are: the avoidance of hemolysis, air embolism, clot embolism, and acute dilation of the heart. The greatest risk from the operation is that from hemolysis. This danger can be avoided in the vast majority of cases if careful hemolytic and agglutination tests are always made preliminary to transfusion. While laboratory methods have their limitations and are not infallible, still if the tests are always carefully made, the danger from hemolysis is slight. The danger from air embolus and clot embolus can always be avoided if proper care is exercised in carrying out the technique of the operation. The danger of acute dilatation of the heart is probably not as great as is generally supposed. So far the writer has not encountered a case in which there was any evidence of the heart having been embarrassed by the transfusion. It is well, however, not to inject the blood too rapidly in very weak and anemic patients, especially if it be the first transfusion.

Reactions Following Transfusions.

The majority of our patients have not experienced any noticeable reaction whatsoever. In about five per cent. of cases a slight chill has occurred, followed by temperature, and in an additional five per cent. a temperature 101 degrees or above developed the same evening or day following the transfusion. This applies to transfusions in which the patient and donor were in the same blood group, as classified by Moss. Whenever we deviated from this and used a donor from a different blood group than that of the recipient, as was occasionally necessary, the transfusion was usually followed by a marked chill and temperature. A donor from a different group than that of the recipient was never used, except when the patient was in one of the rarer groups and it was difficult to find a donor belonging to the same group. In these instances a donor was chosen from group IV., a group whose corpuscles would not be agglutinated by the serum of the recipient.

In a little more than one per cent. of cases a more marked reaction occurred, followed by a hematogenous jaundice, but without the immediate severe symptoms which accompany a severe hemolysis. The donor in each instance had been classified as belonging in group IV., and occasionally when the recipient was also classified as a group IV. It would seem that some individuals classified as belonging to group IV. are not truly group IV., but are borderline cases, somewhere between group IV. and one of the other groups.

Blood Transfusions in Anemias.

Secondary Anemia: In cases of persistent oozing of blood in small amounts from any part of the body, with a consequent drop in the blood picture, or in

which there is constant destruction of circulatory elements from an infective or toxic process, blood transfusion has been found of great value. Amounts of 500 to 700 cc. repeated every six to ten days will bring about a great change in the clinical condition. While the patient is being transfused the primary cause of the anemia should be removed if possible. The transfusion should be repeated until the blood picture is permanently improved. In the majority of cases, however, one transfusion of 700 cc. of whole blood will be sufficient to bring about the desired result. Conditions included in this class are: intestinal bleeding, epistaxis, pulmonary hemorrhage, hemorrhoids and hematuria from various causes.

Spleno-Myelogenous Leukemia.

Blood transfusions have not proved to be of any benefit as far as the leukemia is concerned. If, however, the leukemia is accompanied by a severe anemia, a marked general improvement will follow a series of blood transfusions. The leukemia will be greatly benefited temporarily by the use of X-ray or radium. In fact, early in the disease the white count can be reduced to practically normal for a short time with a corresponding improvement of the patient's general condition.

It is still an unsettled question as to the advisability of removing the spleen in this disease. If such a procedure is contemplated, the white count should first be reduced by radium or X-ray, as splenectomy in the presence of a high leucocyte count is extremely hazardous, but after the white count has been reduced to under 20,000, it is a comparatively safe procedure.

Banti's Disease and Hemolytic Icterus.

These conditions are essentially surgical and blood transfusion is not indicated where the blood picture is not materially lowered. When, however, the red cell count is lower than 2,500,000, or there are persistent hemorrhages, blood transfusion should be resorted to as a preliminary treatment to splenectomy. The latter procedure offers the only hope of a permanent abatement, but the previous administration of new blood usually allows of a better surgical risk. If the spleen is removed early, the immediate and ultimate prognosis is very good in both Banti's disease and hemolytic icterus. Therefore, splenectomy is indicated in these conditions as soon as the diagnosis can be made.

Pernicious Anemia.

The transfusion of blood in pernicious anemia has recently received a great deal of attention and has been advocated by some as the sole means of treating this disease. Others have recommended splenectomy. The results from both have been disappointing. The group of patients who have been splenectomized for pernicious anemia during the past few years is sufficiently large to permit the conclusion that removal of the spleen will not cure this condition. Since it seems that pernicious anemia is the result of infection

which is primary elsewhere than the spleen, it is evident that some further attempt should be made to relieve this condition than mere removal of the spleen.

While the etiology and pathogenesis of pernicious anemia is still a perplexing problem, it seems evident that besides there being present a condition of increased hemolysis, there is some toxic action on the bone marrow. From the study of our cases we have been impressed with the value of the observations of Hunter (4) with respect to the toxic or even infectious nature of the disease. Just what the infective agent or toxin concerned in pernicious anemia may be is a matter of much speculation. Moffit (5) believes there is an agent which may act differently at various times, or that there may be several hemolytic poisons which may cause splenic, hemolymphatic or marrow hemolysis.

The fact that removal of the spleen brings about a marked reduction in the blood destroyed would indicate that the increased hemolysis occurring in pernicious anemia is in some way associated with an abnormal functioning of the spleen. Robertson (6), in studying the blood destruction in pernicious anemia before and after splenectomy, found that the greatly increased hemolysis present before operation showed a constant and marked decrease after operation.

Early in our work, in studying two cases of pernicious anemia, it was noted that symptoms of chronic cholecystitis were a prominent feature of the history, and had been present for a considerable time previous to the onset of the anemia. The existence of an infected gall-bladder was demonstrated in both cases when the gall-bladder was drained. Since then every case has been studied for the existence of a chronic infection, and in ninety-five per cent. infective foci were demonstrable. The regions in which foci were found were the gall-bladder, appendix, teeth, tonsils and accessory sinuses to the nose.

In a bacteriological study of nine consecutive cases of pernicious anemia subjected to laparotomy, all specimens removed were sent to the Laboratory of Clinical Research of the Sprague Memorial Institute. The report on specimens follows:—

Case 1.—Specimens examined—spleen, gall-bladder and appendix. The hemolytic streptococcus and streptococcus viridens were grown from the appendix. No growth from spleen or gall-bladder.

Case 2.—Specimens examined—spleen, gall-bladder and appendix. The hemolytic streptococcus and colon bacillus were grown from the spleen. The hemolytic streptococcus and streptococcus viridens from the appendix. No growth from gall-bladder.

Case 3.—Specimens examined—spleen and gall-bladder. Appendix had been previously removed. The colon bacillus was grown from the gall-bladder. No growth from spleen.

Case 4.—Specimen examined—spleen. The appendix had been previously removed and the gall-bladder was pronounced negative at time of operation. No growth from spleen.

Case 5.—Specimens examined—spleen, gall bladder and appendix. Hemolytic streptococcus was grown from spleen. The hemolytic streptococcus and streptococcus viridens from the appendix. No growth from gall-bladder.

Case 6.—Specimens examined—spleen, gall-bladder and appendix. The colon bacillus was grown from the gall-bladder. The hemolytic streptococcus from the appendix. No growth from spleen.

Case 7.—Specimens examined—spleen, gall-bladder and appendix. The straphylococcus albus was grown from the spleen. The colon bacillus and hemolytic streptococcus from the gall-bladder. No growth from appendix.

Case 8.—Specimens examined—spleen, gall-bladder and appendix. No growth from spleen. Hemolytic streptococcus was grown from appendix. Hemolytic streptococcus and colon bacillus from gall-bladder.

Case 9.—Specimens examined—spleen, gall-bladder and appendix. Spleen and gall-bladder were negative. The hemolytic streptococcus and streptococcus viridens were grown from the appendix.

In this series of nine cases of pernicious anemia, bacteria were grown from three of the nine spleens removed, from four of the seven gall-bladders and from six of the seven appendices. The only case not giving a bacteriological growth was the one in which the spleen was the only specimen removed, the appendix having been removed previously. This patient had a longstanding pyorrhœa, for the relief of which a number of teeth were extracted. No culture was made from the mouth.

The predominating micro-organism found was the hemolytic streptococcus, being obtained in seven of the nine cases, the colon bacillus in five, the streptococcus viridens in four, the staphylococcus albus in one.

The spleens removed have shown evidence of a chronic splenitis and usually perisplenitis, indicating that a toxic or infective process had been present.

Smithies has grown bacilli and cocci of the hemolytic variety from infected areas about the teeth, tonsils and accessory sinuses to the nose, in a considerable number of cases, and places particular stress upon the importance of eradicating these foci of infections. Hunter claims that the tongue and mouth furnish the most important portal of entrance of bacteria or their toxins into the circulation in cases of pernicious anemia.

While it is impossible to state anything definte concerning the relation of these various infections to pernicious anemia, it is an interesting observation from both the standpoint of etiology and treatment.

In view of the theory that pernicious anemia is, in all probability, a disease of infectious origin, and that the spleen has an abnormal hemolytic action on the blood elements, with a late bone-marrow exhaustion, it would seem that the rational treatment should consist of three main factors, viz:—(a) an attempt to stimulate the production of new blood by massive step-ladder transfusions of whole blood, (b) to overcome the absorption of hemolytic bacteria or their toxins by the radical removal of local foci of infection, and (c) to attempt the protection of newly formed and old red cells by splenectomy in selected cases.

Each of these steps plays an important part in the treatment: The repeated blood transfusions nourish and stimulate the bone-marrow to action and help to restore the secondary changes in the various organs; the eradication of active foci of infection relieves the patient of a chronic toxemia and possibly of an etiologic factor of the disease; the removal of the spleen reduces the abnormal amount of blood destruction.

Of the one hundred and twenty-nine cases of pernicious anemia which have come under observation during the past seven years, seventy-seven were transfused and subjected to laparotomy, forty-five were transfused and all local foci of infections in which it was possible were eradicated, and seven cases were in such a hopeless condition that no special treatment was advised.

In analyzing the various patients that have been splenectomized, it is evident that certain cases are unsuitable for operation. The degree of anemia present or the length of time it has existed is of less importance in determining whether or not operation should be done than are the clinical manifestations of the disease. Our most striking result with pernicious anemia occurred in an individual who had been sick three years and had passed from clinic to clinic as a hopeless case of pernicious anemia. At the time she came under treatment she had been bedridden for one year, weighed about one hundred pounds, had a red count of 800,000, was unable to take any nourishment and was absolutely helpless. After six blood transfusions, followed by splenectomy, appendectomy, drainage of gall-bladder and removal of infected teeth, this patient made a good recovery. It is now six years since the operation and this patient is enjoying good health and performing the duties of a farmer's wife. Her blood count has ranged between 3,700,000 and 5,700,000 and she has gained eighty pounds in weight.

Indications for Blood Transfusion.

A careful examination should be made in every case of pernicious anemia, especially searching for evidence of cerebral or spinal cord disturbances, and

also to eliminate the aplastic type. The transfusion of blood is of very little value in either case. While the aplastic type will improve during the period of transfusions, they will relapse to their former condition immediately as soon as the transfusion treatment is stopped. The group of patients which present evidence of cerebral or spinal cord degeneration do poorly following transfusions. Patients who exhibit these changes with only a moderate degree of anemia, as is often the case, are practically not benefited at all from transfusions, or in fact by any other form of treatment. The destructive changes in the brain or cord usually progress without interruption. If, however, there is present a marked degree of anemia, transfusion will often result in sufficient improvement of their general condition to justify the procedure. So far we have encountered only one patient in whom the result was different from the above. In February, 1918, a patient came under observation with a blood count of 1,200,000 with definite evidence of destruction in his spinal cord. Following four blood transfusions at intervals of one week his improvement was so marked it was thought justified to do a laparotomy for removal of his infected gall-bladder. At time of operation his spleen was found to be twice its normal size, so a splenectomy, cholecystectomy and appendectomy were done. He left the hospital in one month with a blood count of 4,000,000 and pursued his farm work for a period of twenty-one months, when he contracted influenza. Following this attack he began to go downhill and six weeks later returned in a weakened condition and with a blood count of 1,600,000. Patient rapidly responded to a series of four transfusions and is back doing his farm work again. The difficulty in his legs has not improved, although they are no worse.

In the majority of cases of pernicious anemia, with the exception of the aplastic type and those with brain or cord lesions, a prompt remission can be brought about by a series of blood transfusions given at intervals of a week or ten days.

The immediate effects of transfusion are usually quite striking. The red blood count is increased, often doubling immediately if the count is very low. The hemoglobin percentage rises and the number of platelets is increased. The blast cells become more numerous and occasionally Howell's particles will appear in the blood, indicating a stimulation of the bone-marrow.

After transfusion the patients immediately, as a rule, volunteer the information that they feel stimulated and "much stronger than they felt before." A few hours later they became ravenously hungry, while previously food had to be forced upon them. This hunger and relish of their food persists even after the red blood count begins to fall. With improvement in the appetite the mental symptoms grow better, the insomnia is relieved and the glossitis clears up. There is no doubt that the transfusion of large masses of whole blood accomplishes more than the mere mechanical addition of so much blood.

This may be due to the fact that the blood-forming organs are not only overworked but are also undernourished. During the interval the patient is being transfused a careful search for local infective foci should be made. Radiographic, cultured and physical evidences of such are frequently found in the tonsils, around the teeth roots and in the accessory sinuses to the nose. When such are found they should be eradicated as far as is possible. The remission brought about in this manner may vary from a few weeks to many months when it will be necessary to repeat the transfusions.

Indication for Laparotomy.

In the absence of evidence of extensive or progressive cerebrospinal damage, laparotomy should be considered in these patients who, after a series of transfusions and the eradication of local foci of infection, are in fair physical condition, and whose blood picture does not remain improved for any length of time. In cases where there is no evidence of bone-marrow stimulation from transfusions as shown in the blood picture, laparotomy is not indicated. When it appears that local foci of infection are present in the abdomen and that there is increased blood destruction by the spleen, laparotomy is justified, provided the above contra-indications are absent. While the comprehensive laparotomy is a very serious operation and must not be attempted on poor risk patients, one is often surprised at the slight amount of shock resulting when it is performed on patients prepared by preliminary step-ladder transfusions. The incision should be in the midline and not through the left rectus muscle, since the gall-bladder and appendix cannot be expediciously excised through the leftsided incision. It is also a fact that splenectomy can be done more readily through the midline, because the splenic pedicle and the vasal brevae can be easily secured from below.

In cases presenting an icteroid color in which hemolysis is marked, as shown by the examination of the duodenal content after the method of Schneider, laparotomy may be indicated in the absence of evidence of any pathological condition in the abdomen, other than that pointing to the spleen. The operation should be exploratory in character, the procedure followed depending upon the pathological conditions found. In our cases the spleen was usually removed, but only rarely did exploration reveal that the spleen alone was involved.

From the seventy-seven laparotomies performed, the spleen, gall-bladder and appendix, were removed in fifty-four cases; the spleen and gall-bladder in eleven; the gall-bladder and appendix in four and the spleen alone in four. There were eight deaths or an operative mortality of eleven per cent. These included all cases that died before leaving the hospital. One death occurred four weeks and another two months after the operation. In all cases, except three, one or more transfusions were given previous to operation. In forty cases a transfusion was given on the table at the finish of the operation, and in

ten cases a transfusion was given during the interval between the operation and when the patient left the hospital. Of the sixty-nine cases that left the hospital, five had recurrence of symptoms at end of four months and died at intervals of eight to twelve months. Ten had recurrence at end of six to eight months and followed about the same course. Forty-eight were in good condition at the end of twelve months. Of these, twelve are alive at the end of two years, nine at the end of three years, four at the end of four years, five are living nearly five years since operation and one a little over six years. Two of the five year cases have been retransfused, one several times, the other only twice. The one living six years since operation has had no transfusion since operation. Two of the four year cases have been back for transfusions, as have also four of the three year cases, five of the two year cases and eight of the one year cases.

The progress of the four cases in which the gall-bladder and appendix were removed without the spleen was not as good in any instance as was the average of other cases. They did not experience the immediate remission of the average case of the other group, and all of them had an early recurrence of their anemia which had been temporarily improved by the transfusions. The spleen was not removed in these patients because it was not enlarged and there were no adhesions to indicate that there had existed a splenitis or perisplenitis. It is evident that some of our patients should not have been operated, as undoubtedly just as good or better results would have followed transfusion alone.

Forty-five cases were treated by transfusions without other surgical procedures other than those for the eradication of local foci of infection when present. In ten of these, most of which were of the aplastic type, no marked improvement resulted. In twelve cases, all of which presented evidence of cerebral or cord involvment, some improvement was noted in the blood picture and general condition, but the nerve destruction progressed without interruption. In twenty-three cases the transfusions brought about a marked improvement and in some a very rapid remission of the disease resulted. In no instance was the remission as complete as it was in several of the cases which were operated. The longest remission noted following a series of transfusions was eleven months, the majority however required repeated transfusions at much shorter intervals. Two patients are still enjoying fair health after the lapse of nearly two years since their first transfusion.

It cannot be said that the regime as outlined in this paper will result in a cure in any case of pernicious anemia. From our experience it seems reasonable to state that twenty-five per cent. of these individuals can be removed from an invalid class to the useful class for a few years, and that in fifty-six per cent. their lives can be prolonged a sufficient length of time to justify the procedures.

Sufficient time has not elapsed to determine the relative values between the treatment of pernicious anemia by transfusions alone and that by transfusions plus splenectomy and removal of other foci of infection in the abdomen. It is our opinion, however, that in properly selected cases blood transfusion plus laparotomy, as outlined above, will give more prompt, more complete and longer remissions of the disease, than by transfusions alone or any other known treatment.

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Abstracts

OBSTETRICS AND GYNAECOLOGY.

Conservative Operation for Chronic Pyosalpinx.

BREWITT (*Zentralbl. f. Gynäk.*, May 1st, 1920) records 12 cases of chronic pyosalpinx, in which the pelvic organs were found to be adherent to one another, there was evidence of congestion and inflammatory exudation in the pelvic peritoneum, and one tube was found to be distended with serous or purulent fluid. The operation performed was as follows: The patient being placed in the high pelvic position, the intestines were shut off by swabs. The pyosalpinx was punctured at its most prominent part by a thick cannula, and its contents were aspirated. Sterilized oil of turpentine, in slightly less amount than that of the fluid withdrawn, was now injected, and the site of injection sutured with fine catgut; 4 or 5 c.cm. of the same preparation were then introduced into the uterine and fimbriated extremities. Adherent coils of intestine were gently freed from the adnexa by means of a swab. The omentum was brought into the pouch of Douglas and sutured there by three or four catgut stitches with the object of shutting off the pelvic from the general abdominal cavity, and of bringing an increased blood supply to the pelvic organs. Bacteriological examination of the aspirated fluid was not undertaken, but in 10 of the 12 cases the gonococcus was found in the external genitals. No rise of temperature took place after the operation, and the after history was uniformly good. The inflamed masses disappeared in the course of four to six weeks, when the uterus was found in all cases to be freely movable, and the adnexa were less, or not at all, tender. In three cases pregnancy followed within a few months of this treatment.

Mammary Hypertrophy Treated by Subcutaneous Injections of Human Milk.

PATEL (*Gaz. hebd. des Sci. méd de Bordeaux*, May 9th, 1920) records the case of a woman of 22 who had been married but never pregnant, whose breasts became enlarged after an attack of influenza, and had an estimated weight of 5 kilograms each. The patient demanded amputation, but Patel treated her by subcutaneous injections, made at ten days' intervals, of 5 c.cm. of human milk. The organs began to grow smaller after the fifteenth day, and in a few weeks presented the appearance of deflated balloons. They have been stationary in size for four months, and do not show any alterations at the time of menstruation.

Primary Cancer of the Ovary in a Girl of Thirteen: Ablation: Cure.

PELISSIER (*Bull. et Mém. Soc. Anat. de Paris*, March, 1920) records the case of a girl of 13 in whom in April, 1916, an abortive attack of appendicitis was thought to have occurred. Two months afterwards right ovarian cyst was diagnosed. At operation in July the right tube was removed, together with a kidney-shaped ovarian tumour

the size of an ostrich's egg. The interior of the tumour showed much haemorrhage and necrosis; microscopic examination showed it to be carcinoma of pseudo-papillary character. No recurrence has occurred during the three and a half years which have elapsed.

The Pathogenesis of Cerebral Haemorrhage.

PARLETTI (*Rif., Med.*, January 24th, 1920) throws doubt on the current views as to cerebral haemorrhage being exclusively due to changes in the blood vessels and increased endo-arterial pressure. He thinks we might go back to the ex-vacuo theory in a modern form. So far from bleeding people who suffer from cerebral haemorrhage he says it would be better, especially as a preventive, to increase the intracranial pressure by injecting artificial serum into the spinal canal. He believes that haemorrhage is induced by some enlargement of the space between the brain and skull, and subsequent distension of the veins and small arteries, until they burst, so that by injecting serum into the spinal canal the intracranial pressure would be increased and the tendency to haemorrhage checked. The premonitary symptoms of cerebral haemorrhage (giddiness, headache, etc.) are, he believes, better explained by supposing that there is diminished endocranial pressure and consequent expansion of the vessels, than by assuming that they are due to a permanently altered state of the blood vessels. Possibly in advanced age the cerebral fluid tends to diminish as part of the senile shrivelling of tissues.

The Criminological Value of a Fourth Horizontal Frontal Convolution.

PITRES and LANDES (*Journ. de Méd. de Bordeaux*, April 10th, 1920) state that though Benedikt and several other writers attributed criminological importance to duplication of the convolutions of the frontal lobe, this anomaly has been found in a relatively high proportion of persons who are not criminals. They describe the autopsy on a man aged 26, who had been executed for the rape and murder of a girl aged 6, the findings being as follows: Thoracic and abdominal organs normal; a few slight stigmata of degeneration in the skull and face; weight of brain much below the normal (1.032 kg. as compared with the average 1.360 kg.), thickening and adhesions of the dura mater, and an incomplete duplication of the second frontal convolution on both sides. Examination of the brain was otherwise negative.

Acetonæria in Influenza.

G. IZAR (*Il Policlinico*, Sez. Prat., April 19th, 1920) in a large number of cases of influenza has found in the urine acetone and diacetic acid either separately or together. They were present not only in cases with visceral localizations, but also in uncomplicated cases. Izar is inclined to the view that some of the symptoms of influenza, such as vomiting, somnolence, and dyspnœa, when this is not due to circulatory, respiratory, or renal disturbance, may be attributed, in part at least, to acetonæmia. Six illustrative cases in patients aged from 6 to 58 years are recorded.

Quotations from Doctors:

No. 7

"The majority of cases of pneumonia, in my experience of thirty years' medical practice, have had more or less pleuritic complications.

"I presume this is the experience of my colleagues.

"The most grateful application that can be made to a patient suffering with pneumonia is a warm

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poultice under a moderately firm binder or jacket. Its action is first through the superficial vessels, and then more slowly but just as efficiently on the deeper congested parts."

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DIAGNOSIS OF SCIATICA

G. Roussy and L. Cornil *(La Medecine,* Feruary, 1920) describe three new tests for sciatica: (1) Lateral flexion of the trunk. If the patient standing in the upright position with his hands on his hips is told to flex his trunk laterally, first to the right and then to the left, without bending the lower limbs, a limitation in lateral flexion will be observed, as a rule on the side of the pain, more rarely on the opposite side. (2) Dorsal flexion of the foot. This test should be carried out with the patient in the dorsal decubitus, the affected limb being in the position of maximum extension. The foot is suddenly flexed on the leg, thus causing an elongation of the curve, especially of the posterior tibial. In genuine cases an immediate antalgic reaction occurs, shown by flexion of the leg on the thigh and of the thigh on the pelvis so as to relax the elongated nerve. The pain is localized by the patient in the calf, and sometimes all along the trunk of the nerve on the back of the thigh. (3) Internal torsion of the foot. This movement causes a pain on the outer surface of the leg, especially below the head of the fibula, and the patient flexes the lower limb to relieve the pain. Elongation of the external popliteal nerve is probably the cause; the fact that this nerve is much less sensitive than the internal popliteal explains why this sign is less frequent than that of dorsal flexion of the foot.—B.M.J.

INJECTIONS OF VASELINE INTO ABSCESSES AND PHLEGMONS

For the past twenty years E. Lindstrom *(Svenska Lakaretidningen,* January 30th, 1920) has been experimenting on lymphadenitis, abscesses and phlegmons, making small incisions, through which he injected vaseline alone, or various drugs with vaseline as a vehicle. Pure vaseline proved as effective as any combination of vaseline with other drugs. He regards this treatment as particularly suitable for out-patients and general practice; the technique is easy, and the discomfort to the patient minimal. After disinfection of the skin by ordinary methods, one or two incisions, according to the size of the inflamed area, of about 1 cm. are made, and, if pus has already formed, it is squeezed or washed out. The abscess cavity is filled with vaseline, melted in a water bath and introduced through a syringe. The cavity is first irrigated with the vaseline, with which its remote corners and crevices are then distended. The syringe having been withdrawn, the incision is blocked by a cold compress till the vaseline has stiffened. An ordinary dressing is left in place for four or five days. In some cases these injections have to be repeated. The author claims

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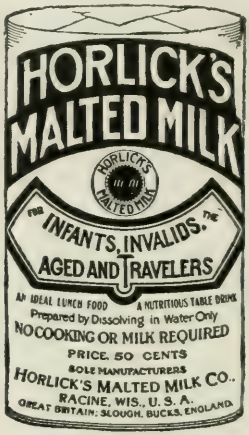

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for this treatment the advantages of painlessness (provided an ethyl chloride or ether spray is used), insignificant haemorrhage, rapid healing, and, because of the smallness of the incision, no disfiguring scar formation. Owing the gradual escape of the vaseline the incision does not become blocked nor dressings is definitely contraindicated.—B.M.J.

is pus retained; plugging the abscess cavity with

Surgery

TREATMENT OF WOUNDS OF THE LIVER.

Aievoli (*Rif. Med.*, March 13th, 1920) points out that whilst in war by far the greater proportion of liver wounds are made by shell fragments, etc., in civil life the wounds are mostly made by cutting instruments, so that the lessons derived from the war may not in all cases be utilized in civil practice. The size of the liver made it a frequent resting-place for flying fragments during the war, and its division into a thoracic and an abdominal area corresponds to differing results from injury. Attempts have been made to draw up a scheme for the localization of the effused blood according to the part of the liver injured, but it seems doubtful whether this is reliable. In spite of the experience of the war there is still wide difference of opinion as to whether it is desirable to operate. Souleyran intervened 221 times out of 297 and refrained in 76. Of the 221 operated on, 135 died and 86 were cured; of the 76 not operated on, 15 died and 61 recovered. The liver may be approached by various abdominal incisions, through the thorax or through the pleura. The wound itself may be treated by thermocautery, ligature, plugging, or suture.

CADMIUM POISONING.

Stephens (*Journ. of Industrial Hygiene*, August, 1920) records the case of a spelter worker of 67 who for ten years had been thought to suffer from plumbism, the chief symptoms being weakness, wasting, and bronchitis. At the autopsy the kidneys showed chronic interstitial inflammation, and the heart was hypertrophied. The liver contained no lead, but traces of copper, cadmium 0.91 grain per pound, and zinc, 0.77 grain per pound. The author has seen eight other cases where the analysis showed similar amounts of these metals. Most authorities agree that zinc is non-poisonous. Stephens believes that men with cadmium poisoning are often thought to have a typical lead poisoning; the severe colic of that disease is absent, diarrhœa may occur, and there is well marked epigastric pain or tenderness.

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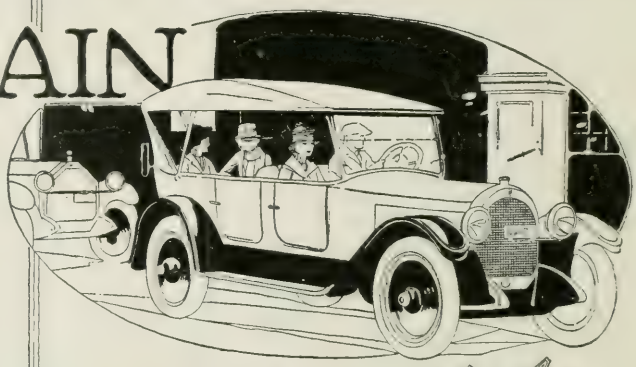

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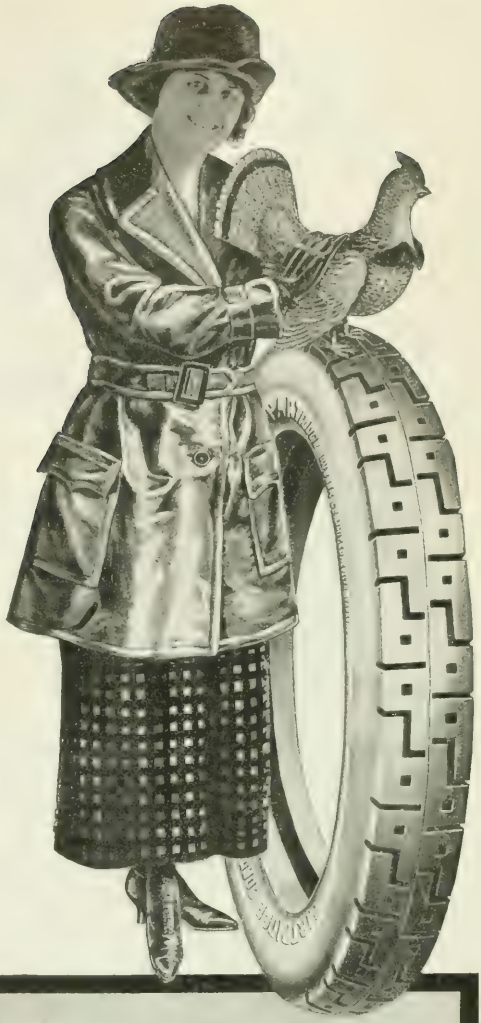

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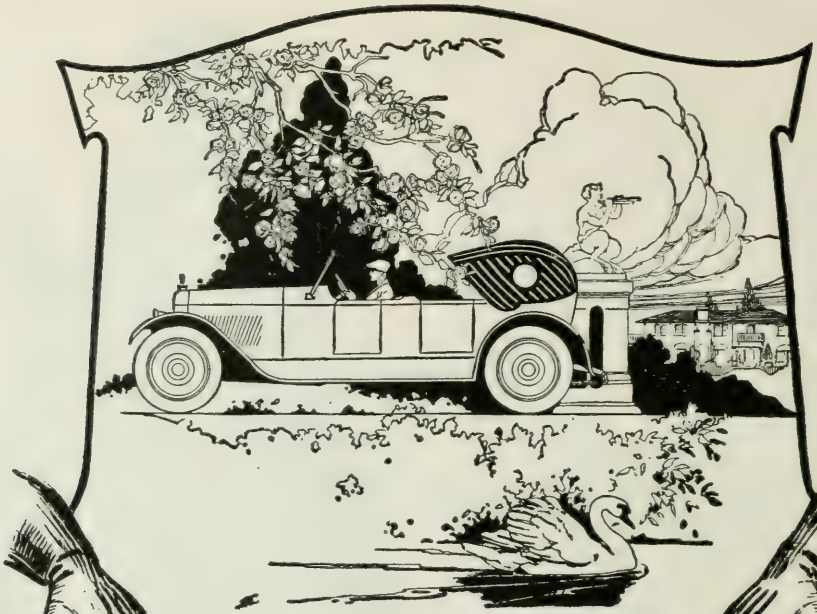

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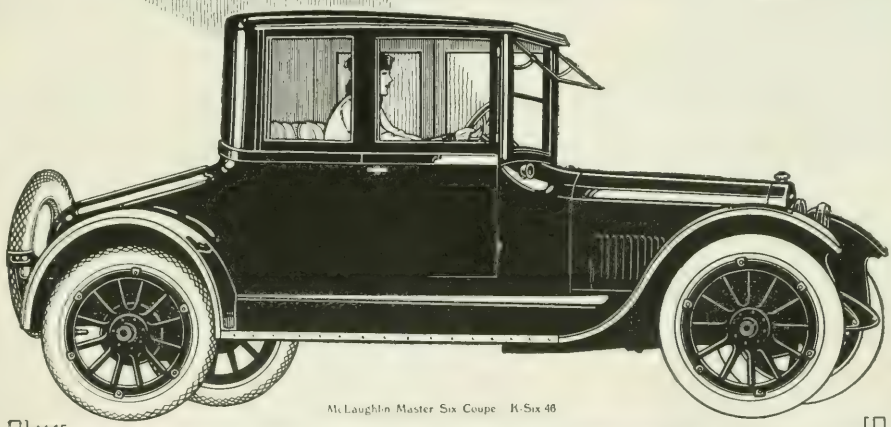

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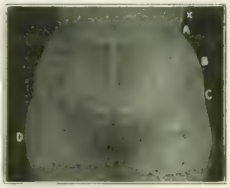

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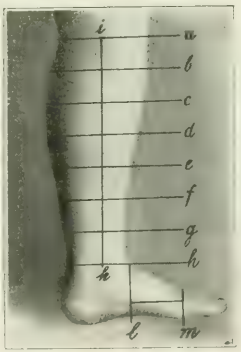

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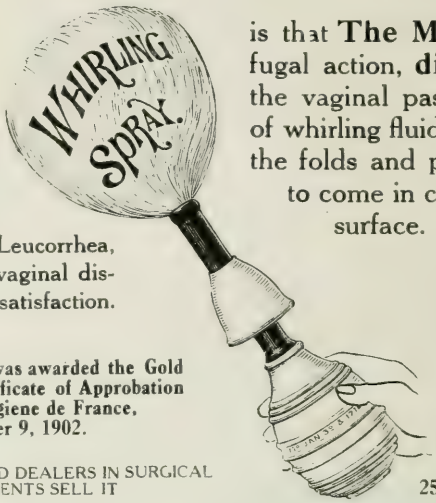

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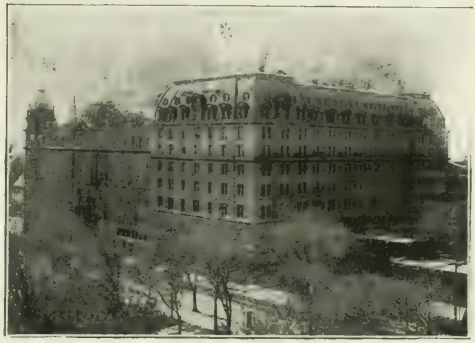

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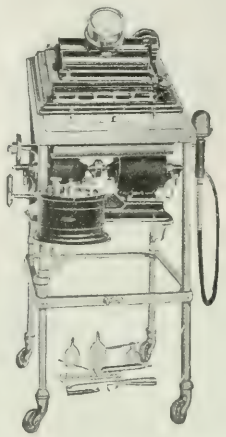

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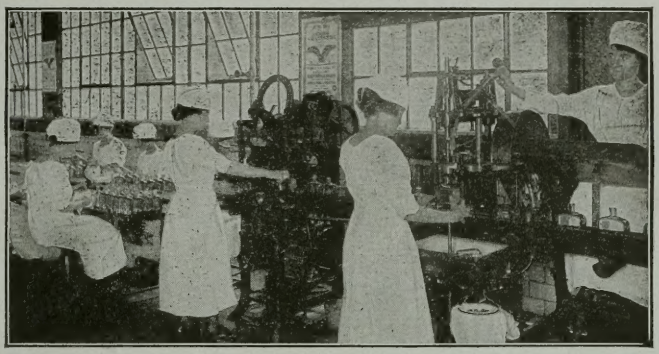

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